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ABSTRACT

A study was done to determine the extent of current employment, expected job growth, necessary job skills, and the educational background preferred by employers in the solid waste field. Eight different questionnaires were developed and representatives of the solid waste management industry from 1,004 state agencies, municipalities, and private companies, both within Connecticut and nationwide, were surveyed. Based on 297 responses, there were 7 conclusions, some of which follow: There will be a steady increase of manpower requirements in resource recovery and hazardous waste management areas as well as the demand for skilled labor increasing and unskilled labor decreasing; many towns in Connecticut having less than 20,000 population will continue to use sanitary landfill operations whereas larger towns will be using resource recovery methods; and in municipalities, nationwide, the development of sanitary landfill operations requiring both skilled and semi-skilled labor is the trend. Some of the recommendations included the need for vocational educational institutions to collaborate with local, State, and Federal agencies to meet the manpower needs of the future in the field of solid waste management, and the need for a systems analysis on State and Federal levels to correlate and consolidate data on the technological training required to meet tomorrow's employment needs in solid waste occupations. (The eight questionnaires are appended.) (EM)

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SURVEY OF
ENVIRONMENTAL TECHNICIAN EMPLOYMENT NEEDS
IN SOLID WASTE OCCUPATIONS

June 1977

By

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Research and Planning Unit
Division of Vocational Education
Connecticut State Department of Education
Hartford, Connecticut

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PREFACE

The manpower program in the national pollution control effort is a key consideration for improving man's well-being in our country. The present market condition, manpower shortages and specialized occupational needs are the subject matter of the present survey.

The review has been made on all available literature and unpublished data provided by several organizations and individuals relating to manpower needs in the field of solid waste management in Connecticut as well as in the nation.

It is true that the thoroughly tested data in solid waste management is not available and so the attempt has been made to avail the experience and opinion of experts in this field to analyse and interpret the available data for the effective input in the research area of environmental manpower information.

I gratefully acknowledge the contribution of our reviewers, Mr. Charles Kurker, Principal Engineer, Solid Waste Management Unit of the State Department of Environmental Protection; Mr. Roger Skelly, Assistant Director, Manpower Research and Information Division, Connecticut State Labor Department; Mr. T. Darrah Moore, Vice President and Richard A. Volonino, Project Sales Manager, of Combustion Equipment Associates.

Special thanks are given to Mrs. Doris B. St. Onge, Research Assistant of this project for organizing the research data and helping in all possible ways in the preparation of this report; Mrs. Mary Louise Waterman for exhibiting skills in typing; and Mrs. Margery Cooper for drawing maps, duplication and collation of all the material for this typescript publication.

To all people who have contributed to the development of this publication, appreciation is extended.

SUMMARY

The purpose of this research project was to determine the extent of current employment in the solid waste field, expected job growth in the field, needed skills for performing the job, and the type of educational background preferred by employers of solid waste technicians.

A review was made of all available literature and unpublished data provided by several organizations and individuals relating to manpower needs in this field.

To obtain effective information, 1,004 state agencies, municipalities and private companies, both within the state of Connecticut and nationwide, were surveyed. Eight different questionnaires were developed and sent to representatives of the solid waste management industry in both the public and private sectors. From these surveys, 297 responses were received, representing 29%. In addition, 25 responses were received too late to be included in this report.

In the state of Connecticut, many smaller towns expect to continue using the sanitary landfill method of solid waste disposal, while 38 municipalities to date are considering joining the C.R.R.A. facility being built at Bridgeport. Nationwide, the trend is similar. The use of open dumps and incinerators is declining. For these reasons, there should be an increasing demand for skilled personnel to operate landfills and for trained technical personnel at resource recovery and hazardous waste management sites.

A wide range of skills is being utilized at the state level, including geologists, engineers, planners, administrators and clerks, and these manpower needs are expected to increase dramatically with the implementation of the Resources, Conservation and Recovery Act of 1976 (P.L. 94-580).

In the private sector, the job market is also expected to grow as energy conservation programs are implemented and the demand for recycled materials increases. The economy will also be a factor. With the job trend shifting from unskilled and semi-skilled to skilled, more technical training and more managerial skills will be requirements in the future. There will be no substitute for on-the-job training, regardless of the level of formal education an employee attains.

In conclusion, vocational educational institutions should collaborate with local, state and federal agencies to meet the manpower needs of the future in the field of solid waste management.

Employee skills should be upgraded by standard certification programs, short safety courses on OSHA regulations, workshops and seminars and by continuous on-the-job training programs.

The State Department of Environmental Protection and the Employment Division of the State Labor Department should serve as a clearing house for monitoring manpower supply and demand. This referral system could also be established at the local and federal levels.

Finally, a system analysis is needed on state and federal levels to correlate and consolidate data on the technological training required to meet tomorrow's employment needs in solid waste occupations.

BACKGROUND

Introduction

The major purpose of the study was to determine the extent of present employment, future job projection and job potentialities in the emerging areas of the field that spring from acts and regulations of federal, state and local governments. It was also envisaged to determine the types of educational background and curricula preferred by employers to provide data for developing the needed vocational training courses at the post-secondary educational level.

The study reflects where the employment demands would be in public and private sectors, in what areas the substantial increase in manpower is to be expected, and how employees are being trained presently, given their perception of the circumstances in June 1977.

The sample selections were made from several information sources and considerable effort was made to send questionnaires to diverse areas of the solid waste occupational field, namely, solid waste occupations in municipalities, waste paper dealers, waste industry equipment manufacturers, resource recovery centers, scrap metal dealers, junk yard dealers, and the composting industry. A questionnaire was also prepared and sent to all fifty states to obtain current information regarding manpower needs in the solid waste occupations.

The attempt has been made to obtain information in all possible areas of solid waste activities within the state. In order to obtain the future national trend for full understanding of the state picture, employers of selected private and public sectors of the nation were asked to provide current and anticipated levels of employment in these occupations in 1977, 1979 and 1982.

Legislative Framework in Developing Solid Waste Management Manpower Needs

The need and demand for manpower in the solid waste management field and in the state as well as in the nation have been closely related with and dependent upon legislative acts.

In June 1971, Public Act 845 - "An Act Concerning Solid Waste Management," a statewide solid waste management plan, was approved by the General Assembly of Connecticut and signed into law by Governor Thomas Meskill. Later the State Department of Environmental Protection was formed and has undertaken the responsibility of the statewide plan of solid waste collection, disposal and recycling. Combustion Equipment Associates has contributed heavily in the solid waste technology field and shares with the Connecticut Resources Recovery Authority in developing and implementing the resource recovery plant at Bridgeport, Conn. Dan Lufkin, the first State D.E.P. Commissioner, took the approach of resource conservation by committing to the resource recovery technology in the state.

Later, Public Act No. 73-439 - "An Act Concerning Establishment of Connecticut Resources Recovery Authority (C.R.R.A.)" was passed by the General Assembly and C.R.R.A. came into existence. Section 19-524-5 of the D.E.P. Administrative regulations, which was effective on February 14, 1975, states that "an operator certified by the Commissioner or designee of the certified operator must be present in the solid waste facility at all times during operating hours, except as provided by Section 19-524-4d (denial or revocation of a permit) of these regulations." The state solid waste regulations emphasize the needs of manpower especially at the technician level.

According to federal regulations, P.L. 89-272-89th Congress, S306 approved October 20, 1965, entitled as "Solid Waste Disposal Act" which was amended according to P.L. 91-512-91st Congress, H.R. 1183 of October 26, 1970, provides for a federally assisted personnel training program in the nation. P.L. 94-580· The Resource Conservation and Recovery Act of 1976 (Sec. 4008) provides "financial assistance to states, counties, municipalities and inter-municipal agencies and state and local public solid waste management, resource recovery, and resource conservation services and hazardous waste management."

The solid waste technology has moved from open and burning dumps to sanitary landfills in the recent past due to local, state and federal legislations and is presently shifting towards resource recovery and the use of all forms of technology to reduce waste and to produce energy from waste. All these changes will result in the developing needs in emerging occupations. An accurate forecast regarding the changing phase of occupational patterns cannot be estimated accurately at the present time, but the trends are indicated in the present report.

Previous Surveys

The Research and Information, Employment Security Division of the State Labor Department, made a "survey of needs in Environmental Health Occupations, March 1969" for the Bureau of Vocational Education, State Education Department. The report was a general information on environmental health occupations. It is difficult to isolate the solid waste occupation manpower data and analyse it. It appears that tremendous development and changes have taken place in the solid waste management in the state since 1968.

The report under Federal Solid Waste Management Contract No. 68-03-0041 entitled "Manpower Profile and Analysis in the Field of Solid Waste Management, Volume I and II" which was prepared by Applied Management Science, Inc. (1973) is an excellent and thorough review of nationwide manpower needs in the solid waste management field.

The report states, "An overall conclusion is that the solid waste management system has been used in many municipalities as the 'employer of last resort,' that is, as an alternative to welfare. However, in a dynamic industry, this philosophy is contradictory to efficiency and productivity. Whether or not to use solid waste management for this purpose is a policy decision which must be made. Finally, events are occurring throughout the nation which cause major changes in the solid waste management system. The two most important of these events are:

- The imposition of air quality standards at the state and local levels
- The financing pressures which most cities are currently experiencing

The imposition of air quality standards results in the closing of both household and city incinerators. Closing household incinerators increases the total volume of waste and closing the city incinerators forces a complete new disposal system. In the presence of this event, many cities complete restructure their system in some of the following ways:

- Convert incinerators into transfer stations
- Develop new landfill sites
- Seek private sector collection contractors
- Seek private sector disposal contractors

All of these are major perturbations in the system which city officials may not be capable of handling without management assistance from an agency such as E.P.A."

The tasks performed in the solid waste management field in the United States as indicated in the manpower analysis of 1973 were evaluated by the Federal Environmental Protection Agency as follows:

Local Level

"About 99 percent of jobs in the solid waste industry are at the local level in operating agencies and institutions responsible for managing the nation's solid wastes. These agencies utilize a large number of skilled workers including vehicle drivers (44%), a smaller number of unskilled workers (37%) and an even smaller number of supervisory (5%), clerical (5%) and managerial personnel (9%)."

State Level

The solid waste activity is low at "state level in virtually every state" but "one can find a wide range of skills being utilized at the state level, including engineers, planners, economists, public administrators, lawyers, systems analysts, etc."

Federal Level

"Solid waste training effort in the federal government is conducted by the Office of Solid Waste Management Programs of the Environmental Protection Agency and the Bureau of Mines of the Department of the Interior. E.P.A.'s training program includes university grants and fellowships, state training grants, direct training and safety training."

Private Sector

"The private sector is involved in the development and provision of basically two types of training efforts. Private collection and disposal firms, particularly large firms, have begun to provide their own employees with special (as opposed to on-the-job) training in solid waste management.

"Equipment manufacturers, notably heavy equipment manufacturers for landfill and incineration, also provide special training programs to those agencies and institutions who purchase their equipment."

There are several publications on the broader spectrum of the manpower needs for Environmental Pollution Control. The most recent one is the National Academy of Science's report on "Manpower for Environmental Pollution Control (1977)" which is a nationwide study of environmental manpower status and its future trends. The report describes in several sections briefly the employment characteristics of solid waste management in public and private sectors of our economy. Some pertinent facts stated in different chapters of the report are as follows:

- Local government regulatory activity for the collection and handling of solid waste is minimal at the present time. Recent census data indicate that about 700 persons are employed by state governments for solid waste management (U.S. Bureau of Census, 1976). Of that number, probably only a small percent is employed in activities of a regulatory nature.

- Attempt has been made to know current and projected employment in the private sector. But response was poor.

- Solid waste occupations require levels and types of training that range from common labor to scientific research personnel. The large section of labor did not finish high school.

- Industry should encourage students (community colleges) to participate in new or existing environmental training programs.

- The importance should be given to avoid "an excess of trained manpower."

METHODOLOGY

Methods and Procedures

The questionnaire format was used to collect data to disseminate information on present employment opportunities, potentialities and job trends in the immediate and distant future in solid waste management occupations. The base format of the questionnaire was adopted from pages 18-22 of the "Handbook on Employment Security, Job Market, Research Methods - Area Skill Survey," (B.E.S. No. E-252, November 1965) published by the U.S. Department of Labor, Washington, D. C. The questionnaire was mailed to selected specialists (consultants) of the public and private sectors of Connecticut.

The agencies, organizations and individuals who are engaged in solid waste occupations who did not respond in due time were mailed another set of the questionnaire as a follow-up. Some municipalities, private companies and certain individuals were contacted and supplied information over the telephone. The mailing list of this report was prepared from various sources of information (see reference).

The following steps were outlined and followed for preparing this report:

Step I A conference was scheduled with two state specialists (consultants) for preparing the format of the questionnaire and outlining the procedure and schedule of the survey.

Step II Preparation of questionnaire for eight different surveys and sending the base questionnaire for review and suggestions.

Step III Mailing all questionnaires for response.

Step IV Follow up those who did not respond and verify certain information from those who responded to the questionnaire.

Step V Data tabulations.

Step VI Analysis of data and report writing.

Step VII Selection of a consultant panel, two from public sectors, one from the private sector for reviewing the entire "draft manuscript" of the present report.

Step VIII Corrections and modifications as suggested by the panel and submitting the final report to the Vocational Education Department of the state.

Attempts have been made to obtain information specifically in the following areas:

1. Skill areas - Estimation of immediate and long term needs of manpower along with present educational levels of the employees and training areas needed for improving the quality of performance.

2. Employers' comments on the changing pattern of solid waste technology, related occupations and their role.

3. Structural pattern of occupations as reflected in the personnel organization charts.

4. General information - statewide information on solid waste occupations and trends as perceived by state solid waste organizations.

   Job titles in the questionnaire were classified into two broad categories:

   a. Employees who engaged in facilities or operational activities
   b. Employees who engaged in management activities.

The findings as they appear in the tables and narrative analysis refer only to the information summarized from the sample respondents. No attempt was made to expand these sample returns to universe proportions because figures on the total number of firms and total employment in the area of solid waste management were not readily available.

General Response Information

The number of respondents to the Connecticut surveys totaled 178, or 40%. A total of 22% responded to the nationwide surveys.

The response from the private sector in Connecticut was 32% and from the public sector 46%. These included junk yard owners, scrap metal dealers, waste paper dealers, one resource recovery operation and one composting plant as well as the municipalities.

On the nationwide level, response from the private sector was 18% and from the public sector 57%. These included scrap metal dealers, the sanitation industry, resource recovery, composting and state agencies.

FINDINGS AND ANALYSIS

Surveys were made in the public and private sectors on the state and national levels. The findings and analysis of maps, tables and charts are organized in this order.

CONNECTICUT

Municipalities: It appears from the data received that the smaller towns (under 20,000 population) depend on sanitary landfills while most of the larger municipalities (over 20,000 population) are planning to join the C.R.R.A. operation at Bridgeport. Although recycling is emerging, it is not yet strong. Manpower requirements are greatest in the area of sanitary landfills and collection of refuse, especially for foremen, bulldozer operators and general laborers. There are no estimates of needs in the field of recycling and composting - some incinerators are scheduled to close and none of the smaller towns other than New Canaan has an incinerator. Therefore, no occupational needs were projected for incinerator operations. (See tables 2, 3)

The majority of employees receive on-the-job training, while some municipalities prefer that their employees take short training courses such as those provided by D.E.P. From the responses received, 64% of the employees involved in solid waste management have high school diplomas and 23% do not have a degree or diploma. The remaining 13% are college-trained. (See tables 4, 5)

Although the majority of employees are not college-trained, some municipalities expressed interest in curricula relating to the technical aspect of sanitary landfill operations, such as geology and soil science. Others expressed interest in short training courses in areas relating to landfills and recycling or resource recovery. It is interesting to note that, while only one does any composting, 19 municipalities expressed an interest in composting. (See tables 2, 6)

Waste Paper Dealers: Data received from waste paper dealers indicated a high level of employment openings among skilled and semi-skilled labor, including truck drivers and forklift operators. Because many employers did not report the expected level of employment for the future, the projected figures tabulated are not too meaningful. However, there is expected to be a steady growth among those who did report. (See table 7)

There was little interest shown by waste paper dealers in ungrading the skills of their employees. Some would like to see short courses emphasizing basic Mathematics and English and driving skills. High school graduates accounted for 62% of employees tabulated and 16% had no degree. (See tables 8, 9)

Resource Recovery: The resource recovery facility, located in Bridgeport, is being built by Combustion Equipment Associates, Inc. of New York City. Their estimated projected manpower needs are in the area of technical and skilled personnel. Personnel needs are calculated on a ton per day basis and, as tonnage increases, so will their manpower needs. Their report indicates that all employees except vehicle drivers will be trained by them on the job. All employees except general laborers and refuse pickers have received technical school training.

Their projection for the future shows a great need for technicians and a steady increase elsewhere. Salaries at this facility will range from $8,000

to $17,000 for labor and from $14,000 to $18,500 for management. The area of employment where they have experienced the greatest difficulty in finding qualified personnel is that of superintendents (plant chief engineers). (See tables 10, 11)

Scrap Metal Industry: In the Connecticut scrap metal industry, there are many technical personnel needs. Job prospects are expected to continue for the next five years. The salary range for labor is from $6,000 to $15,000, while management salaries range from $6,000 to $25,000. The salary range at the management level appears to depend on the size of the company. Those with more specialized skills earn more than the less skilled. Supply also affects salary, e.g. marketing. (See table 12)

On-the-job training is preferred by the scrap metal industry with 79% of their employees receiving that kind of training. Greatest difficulty in finding qualified personnel is in the area of metal sorters and mechanics, marketing and yard managers. (See tables 12, 13, 14)

Junk Yard Industry: There is a high turnover in the junk yard business with many being small scale family-owned operations. Many were going out of business or are "inactive." Salaries ranged from $8,500 to $20,000 for management and from $8,000 to $13,000 for labor.

While the future employment outlook was uncertain, junk yard owners expressed the need for more skilled and technical personnel, such as metallurgists, equipment operators and brokers. (See tables 15, 16, 17)

Composting: Only one modern composting leaf plant was reported in this survey. Although a number of municipalities indicated an interest in composting, it is in fact neglected at this time and its future uncertain. (See table 18)

NATIONWIDE (Outside Connecticut)

Solid Waste Sanitation Industry (Equipment Manufacturers): Response to this questionnaire was very poor, but from the answers which were received, there is expected to be a significant increase in all personnel needs. Salaries for management range all the way from $7,500 to $35,000, depending on technical skills available. Most of the labor involved in this industry is highly skilled and technical. (See table 19)

Resource Recovery: Many large municipalities are turning to resource recovery to solve their solid waste disposal problems and there appear to be many new, good-paying job prospects in this field. The need for collectors and unskilled and semi-skilled laborers will increase substantially as the amounts of waste increase. Salaries for technical personnel range from $13,000 to $18,000. (See table 20)

In the area of private resource recovery, management jobs are more prevalent. There is a shift to emphasis on highly technological services, requiring training in engineering, supervisory skills and project planning and management. Shortages in these areas appear to be linked with salaries. Management occupations in this industry vary from $12,000 to $39,000 while jobs on the labor side range from $9,000 to $11,000. (See table 21)

Job opportunities in the future will include skilled labor, such as program and plant managers, environmental engineers and technical and supervisory

positions, as well as mechanics, equipment operators and electrical and mechanical personnel. (See tables 22, 23)

Scrap Metal Industry: Immediate and long-term needs exist for skilled labor in the scrap metal industry nationwide. While unskilled and semi-skilled labor is in the lower salary range ($5,000 - $12,000), skilled labor salaries reach as high as $18,000 (mechanics). Managerial personnel receive salaries ranging from $8,000 to $25,000. (See table 24)

Because such a small percentage of those responding supplied educational data, the results are insignificant. (See table 25)

Composting: The only response to this survey was from one municipal solid waste collection operation. This is a new field and the future is uncertain. The salary ranges, in comparison to other solid waste occupations, are low - from $6,880 to $12,000, and include many laborers.

Composting in the United States is on the decline. Sewage sludge composting is a possibility but there is no market for municipal sludge. (See table 26)

State Agencies: At the present time there is a wide range of skills being utilized at the state level including engineers, geologists, planners, attorneys, administrators, clerical help, computer specialists, accountants, consultants and technicians. The smaller the role of each state in solid waste management, the fewer the number of people and range of skills. A large increase is anticipated in the next five years as new legislation is implemented. The anticipated increases were not broken down by job titles. (See table 27)

Employment needs of the state agencies are met by recruitment at colleges and technical schools and through the state civil service system. (See table 28)

Nationwide, job prospects in sanitary landfill operations are increasing while those at incinerators and open dumps are decreasing. Therefore, there is a real need to re-train employees at these levels.

Growth opportunities in composting seem to be negative. Resource recovery is growing rapidly and will offer many job opportunities, as will hazardous waste disposal. Openings at source separation centers will depend on demand and on the functioning unit of resource recovery plants. (See tables 27 - 30)

Flow Chart Analysis: The flow chart of a scrap metal company reflects a pattern of job titles based on the operation conducted. This one shows mostly technical operators at the base.

Resource recovery charts show that programs are still in the planning stage and few are yet at the operational stage.

A sanitation department flow chart shows a diverse range of personnel from unskilled to skilled.

A transfer station flow chart shows manpower, mostly unskilled or paraprofessional, dominating the scene.

Opinion Survey from Employer's Point of View

CONNECTICUT

Municipalities: The larger towns are very much interested in reducing collection and disposal costs by any means. They prefer recycling operations and are encouraging source separation. The towns having populations of less than 20,000 prefer the use of more efficient equipment and transfer stations. They also believe that the probable solution to the present problem is relying on innovative ways of recycling and composting.

Waste Paper Dealers: Anticipated problem is the reduction of profit margin due to high fuel costs in hauling. The problem is well summarized in the following comment: "There have been many innovations in the solid waste industry. Collection equipment has become very sophisticated and workers in the industry are basically either truck drivers or helpers. Technology has increased productivity ten times, yet skills and education levels remain constant and will remain that way."

Composting: Municipal sludge is regarded as the biggest problem in our community but considerable attention is not given to the composting process. If the modern forced air composting method is introduced, few technical job openings may be available in the near future.

Junk Yards: Mostly, junk yards are small family-owned business units. Auto mechanic and OSHA courses would be extremely helpful for junk yard employees.

Scrap Metal Industry: A large turnover of labor is expected in this industry. Recovery processes of residues and metallics from municipal wastes probably would increase job opportunities in this field.

NATIONWIDE (Outside Connecticut)

Solid Waste Sanitation Industry (Equipment Manufacturers): Job prospect is high in this industry. The projected manpower needs, of course, depend largely upon the growth of the economy in the country. Equipment manufacturers prefer on-the-job training for upgrading the employee's skill.

In general, respondents indicated that, in their field, job areas will be expanding in the future and they expect no job areas to be phased out. The economy will, of course, be a factor as to how much growth there will be. While some employees had college or technical school training, all had a high school education and on-the-job training.

Resource Recovery: In the public sector, it is difficult to predict the future trend of the solid waste management program. Budget problems are an important consideration in implementing resource recovery plans. In the private sector, the job opportunities will expand tremendously in engineering direction, especially in the immediate future.

Scrap Metal Industry: The opinion of the majority is that this type of operation does not attract college graduates although job openings are available in the field.

Composting: Composting operations are suffering because of lack of incentives in this direction. There is no market for compost products in our energy-operated agricultural activities.

State Agencies: The majority of agencies have stated that the Resources Conservation and Recovery Act of 1976 (P.L. 94-580) will have an impact on the increase of solid waste management jobs in both public and private sectors. Of course, its future depends largely upon how much Congress appropriates to implement the act. This act will open up job opportunities in the following areas: Source reduction and resource recovery, leachate treatment, management of hazardous wastes and market development. There will be a demand for technical personnel, especially chemical engineers and environmental health technicians to handle hazardous wastes. Manpower needs depend greatly upon regulatory requirements.

In essence, job opportunities expected to expand include the areas of hazardous waste management, solid waste by-product management from municipal, agricultural, mining and energy operations, and resource recovery and utilization. In the future, as natural resources are depleted, increased emphasis will be focused on regeneration technologies in the solid waste management field. Lack of incentives at the present time still hampers movement in this direction.

CONCLUSIONS AND RECOMMENDATIONS

MANPOWER REQUIREMENTS

GENERAL

Conclusion 1

In solid waste management, analysis reveals the fact that there will be a steady increase of manpower requirements in resource recovery and hazardous waste management areas. The demand for skilled labor is increasing while unskilled labor is decreasing. The largest requirement in the private sector will be for operation and maintenance of waste management equipment.

STATE OF CONNECTICUT

Conclusion 2

Many towns having less than 20,000 population will continue to use sanitary landfill operations whereas larger towns having more than 20,000 population will be using resource recovery methods. The use of "transfer stations" is also increasing. Recycling and source separation are becoming increasingly popular and personnel will be needed to carry out these operations.

Open dumps are phasing out. The use of incineration is slowly declining. In many cases these are being replaced by sanitary landfills. The future of composting is uncertain. The manpower requirements in the waste paper dealing industry will depend greatly upon the building and expansion of resource recovery plants as well as market demands.

A wide variety of jobs exists in the scrap metal industry. Manpower needs in this industry are expected to increase at all levels.

The employment outlook in junk yards, although uncertain, expresses the need for more skilled and technical personnel in this operation.

The resource recovery plant at Bridgeport requires a large number of technical personnel for operation at all levels.

NATIONWIDE

Conclusion 3

In municipalities, nationwide, the trend is the development of sanitary landfill operations which require both skilled and semi-skilled labor but the need for "waste collectors" (unskilled labor) will increase. Municipalities of large size are either doing feasibility studies or have resource recovery facilities in the planning stage so it is likely that there will be an even greater demand for personnel in the future. Job prospects are relatively brighter in the scrap metal industry. Its expansion, of course, depends upon the rate of increase in the demand for recycled materials and energy conservation programs. Composting is declining. Resource recovery and hazardous waste disposal management is getting priority in most states of the country.

JOB POTENTIALITIES

Conclusion 4

The shifting trend of job types is from unskilled to skilled in nature. As a result, the turnover figures are increasing and there is a constant filling in of positions in newly developed areas in the field. The demand for technical personnel especially experienced in management, chemical engineers and environmental health personnel will increase. Technician level jobs will expand in resource recovery and the hazardous waste management field.

EDUCATION AND TRAINING

Conclusion 5

In Connecticut municipalities, no high degree of education is needed, particularly for sanitary landfill operations. On-the-job training is the rule. Some municipalities would like their employees to take short courses on landfills and recycling and to find more efficient ways to operate landfills and run collection routes. Courses on geology and soil science are thought to be useful.

Waste paper dealer employers have shown little interest in upgrading their employees' skills. In the scrap metal industry, about 80% of labor receives training on the job. Courses on auto mechanics and safety are thought to be helpful for junk yard employees, although no special formal education is required.

In resource recovery, in addition to technical school training which all employees have with the exception of general laborers and refuse pickers, all employees except vehicle drivers receive on-the-job training.

SALARY LEVELS

Conclusion 6

The salary levels in solid waste management are significantly higher than the other environmental pollution jobs excepting the clerical/secretarial category. The salary level is high in the private sector and again it is proportional to the size of the plant or organization. Stratification of salary levels - unskilled is in the bottom layer, technicians are in the middle and supervisory and engineering skill jobs are on the top of the scale. Disparity of wages in the unskilled and technical level is due to long working hours but the management level jobs largely depend upon technological qualifications and also the supply-demand factor in manpower requirements. The solid waste management jobs are leaning toward sophisticated technology and hence the salaries in the field would be rewarding.

MANPOWER POLICIES AND LEGISLATION

Conclusion 7

The demand and supply situation of solid waste occupations is largely dependent upon legislative acts and budgetary considerations. Most management jobs in the public sector are the result of federal and state acts and regulations. Manpower needs and issues are not considered adequately on local level ordinances, state and federal acts and regulations.

Recommendation 1

A system analysis is needed at state and federal levels to develop new approaches in handling the new trend of technology within the existing labor force and management.

Recommendation 2

The State Department of Environmental Protection and the Employment Division of the State Labor Department should act as a clearing house for continuous source information for developing a procedure in monitoring manpower demand and supply in the state.

Recommendation 3

Attempts should be made for collaborative efforts on the part of vocational educational programs and institutions, local, state and federal agencies and also industry to improve the quality of work.

Recommendation 4

All levels of personnel should be properly trained. Continuous on-the-job training programs are needed. Safety and short training courses on OSHA regulations are needed for all levels of employees.

Recommendation 5

Standard certification programs in all technical operations should be encouraged. Seminars, workshops and short training courses are very suitable for upgrading employees' qualifications.

Recommendation 6

Correspondence courses for operators, especially areas in formal training routes, could be organized at community college levels. Formal and technical workshops are needed for engineers and for supervisory jobs.

Recommendation 7

A special study is needed to ascertain the well-defined steps of substantial remuneration in the career ladder of labor and management. Financial pressures, manpower turnover and bonus incentives should be studied very carefully before any fundamental changes are introduced in the work force of solid waste management systems.

Recommendation 8

The standards should be set at federal, state and local levels to implement acts and regulations effectively. The manpower reports should be circulated to activate citizen groups and organizations to sponsor manpower and training needs in solving solid waste problems. Establishment of referrals and clearing houses at federal, state and local levels may be useful.

EMPLOYERS' COMMENTS

The following comments quoted from the employer responses are included to present some idea of the attitudes of the respondents.

STATE OF CONNECTICUT

Municipalities over 20,000 population

a. Three municipalities have stated that they would "reduce the cost of collection and disposal by constant revision and review of collection routes."

b. One expects to reduce costs by "use of a new facility," Bridgeport; "emphasizes need for additional technology."

c. Two would reduce costs by "the use of large diesel engine trucks and smaller crews."

d. "All federal funds should be used primarily to encourage and promote recycling of solid waste components."

e. Several said "private collection with shorter hours would reduce costs."

f. One would "encourage source separation and use of federal funds to encourage research toward recovery of refuse materials. Markets for reclaimed materials must be established to provide the economics for recycling."

g. "Within the next few years there will be revolutionary changes in the field of solid waste. The present methods of land filling and incineration will be outmoded, except that incineration will provide energy through steam production."

Municipalities under 20,000 population

Only two of these towns operate incinerators and composting programs. A few (10) do some recycling, mostly on a volunteer basis. Manpower is basically unskilled labor with on-the-job training the main requirement. Most towns participate in short state-sponsored training courses.

Comments on how to reduce the cost of energy for refuse collection and disposal:

a. "Better methods of separation and recycling."

b. "Larger, more economical trailer for hauling." (uses transfer station)

c. "Larger, more efficient equipment."

d. "By going to transfer station system."

e. "Through regional planning," "By joining C.R.R.A.," "By joining a 25 year regional disposal plan."

f. "Major emphasis on recycling."

g. "Good management procedures."

h. "Don't create standards which cannot be met or afforded."

i. "The greatest priority of the federal government should be directed toward developing environmentally safe and economically viable technological alternatives to solid waste management."

j. "I would like to see solid waste converted to heat and/or electric energy for local industrial plants ... we are running out of space at our landfill. We feel the technology is available whereby the community could market its utility."

k. "It would seem to me that landfills have to be phased out and a new system of solid waste disposal be implemented."

l. "Develop technology for a resource recovery program."

m. "Innovative ways of recycling and composting."

Waste Paper Dealers

a. "We are not too concerned with education on the driver level. We do like driving experience."

b. "Minimal formal education"
"No special education"
"The paper recycling business is back-breaking work. People with a higher education do not stay long."
"In most cases an elementary level (education) is all, reading and writing - a knowledge of machinery is good."

c. "Increased amounts of recycling, requiring more separation of materials, fewer waste disposal areas increasing distances to be traveled, requiring more man hours."

d. "Recycling requires profitability to work - higher fuel costs with no added incentives will cut into profit margins."

e. "There have been many innovations in the solid waste industry. Collection equipment has become very sophisticated and workers in the industry are basically either truck drivers or helpers. Technology has increased productivity ten times, yet skills and education levels remain constant and will remain that way."

Scrap Metal Industry

a. "There is a large turnover of labor in this industry."

b. "Residue recovery and recovery of metallics from municipalities are seen as job opportunities in the future."

Junk Yard

a. Most of these are small family-owned businesses where one of two employees do several jobs.

b. All got their training on the job.

c. Two junk yard officials said, "Technical school training and knowledge of auto mechanics are useful."

d. Four favored a short training source on OSHA requirements.

e. Two would "change name from junk yard to auto recyclers or dismantlers."

Composting

a. "Municipal sludge is the biggest problem of our communities today. It can be composted in three weeks and after about a month's storage, there is no odor of any kind, and this is the cheapest way to make anything of sludge. The process can be done with about $200 worth of pipe and an exhaust fan for each 200 cubic yards of compost to be made! This should create work in every community. This capital investment can make 3400 cubic yards a year."

b. "I would like to see more attention given to the value of composting by letting microbial life do the work for us on solid waste via the modern compost method. It is a forced air method, moving the air through the compost pile instead of heavy machines to turn the composting waste. It is a power saving method, only requires three weeks and the U.S.D.A. has researched and recommends the method."

NATIONWIDE (Outside Connecticut)

Resource Recovery - Public

a. "An energy and resource recovery system is likely to replace our present landfill disposal operation."

b. "At this time we do not know which direction our solid waste program will take. Depending on the sophistication of the system, e.g. resource recovery, the technical skills needed would be higher than if we have a simple incinerator program."

c. "Auburn's solid waste program is in a state of transition and the finite change in direction should lead to a more exact determination of personnel needs."

d. "We are currently involved in a solid waste management study which will increase productivity, lower costs and adopt new methods."

e. "The federal law outlawing landfill operations should affect your studies. Difficult to estimate staff required in future."

f. "Finding qualified people who want to work, starting from the bottom and training up and willing to learn, having basic skills to begin with ..."

g. "Even though the need is clearly evident for trained personnel in solid waste ... budget problems make future staffing prediction rather uncertain."

Of the responses we received, seven indicated that they either have no resource recovery program at present or no longer employ any personnel in solid waste occupations.

Five responses indicated that resource recovery programs are either in the planning stage or feasibility studies are being done.

Resource Recovery - Private

a. "Most personnel in the private sector of resource recovery are either college or technical school educated, as most of the jobs are in the management area."

b. "Greatest difficulty is found in acquiring good mechanical engineers, designers and draftsmen; also millwrights, welders and mechanics."

c. "Job opportunities expected to expand significantly are for mechanical engineers, designers and draftsmen in engineering and plant operations."

d. "Solid waste reclaimation is a new field that requires new, clever and inexpensive solutions."

Three private companies responded. One of them utilized the matrix concept of organization. The various business entities, such as the Environmental Systems Department which manages environmental products and systems, utilize the services and manpower from the company's functional group. Accordingly, the Environmental Services Department will draw upon the engineering department, sales department, etc. for their manpower needs.

Another firm submitted interesting material showing how their operation converts total waste (garbage, glass, metal, tires, paper, even sewage sludge) into a valuable end product (fertilizer) approved by U.S.D.A. and U.S.E.P.A., among others. No specific job titles or occupations were listed to assist us in our tabulations.

Scrap Metal Industry

a. "Many of the buyer, trader and managerial personnel have college educations but did not train for the particular work they are engaged in. They were exposed to the work and learned from experience and direction."

b. "We find it most difficult to obtain and keep general labor because, for the most part, our type of business is dirty, hot, etc. and we find people leave to collect unemployment or welfare rather than work."

c. "Ours is a dirty, not glamorous business which does not attract the average industrious person."

Composting

a. "The difficulty is not in finding qualified personnel but in finding sufficient funds for a tax-structured municipality."

b. Mobile, Alabama had a composting plant several years ago which did not work out. Its end product was a soil conditioner which was excellent in reclaiming sandy areas but the cost of the operation was excessive for the municipality and it was abandoned. The present operation does not foresee any significant increase in job opportunities in the future. All their employees receive their training on the job. Many of their laborers do not have a high school education.

c. The Tennessee Valley Authority wrote a letter explaining that they could not provide any information on the composting industry skill survey because their pilot program at Johnson City, Tenn. was terminated. They did offer a number of opinions about the future of composting:

The greatest difficulty in finding qualified personnel is in the area of certified landfill equipment operators, engineers with academic and field training in solid waste management, and research engineers and scientists in resource recovery and hazardous waste management fields.

State Agencies

Comments on the prospect of manpower needs in the solid waste management field:

a. "We anticipate an optimum program of 60 professionals for Department of Health role in hazardous and solid waste management. The State Solid Waste Management Board and State Water Resources Control Board are also involved with solid waste activities in California."

b. "Probably limited to trained professional chemists, chemical engineers, and environmental health personnel. A concerted effort will be made to process hazardous wastes for reuse."

c. "With the passage of the RCRA of 1976, there should be a dramatic increase in manpower needs."

d. "The prospect of manpower needs in the solid waste management field is definitely going to improve in light of Public Law 94-580, the Resources, Conservation and Recovery Act of 1976. How much it improves will largely depend on how much Congress appropriates to implement the Act, and the amount of monies that eventually reaches each State/ County."

e. "With strict interpretation and enforcement of the recently passed RCRA, manpower needs for the solid waste industry will increase. Beyond staff increases at the state level, manpower needs for the hazardous waste industry and regional planning agencies will increase many fold."

f. "Looks as if there will be a shortage, especially with provisions of PL 94-580."

g. "Private industry will need technical personnel to manage and operate hazardous waste collection, processing and disposal systems. We estimate new manpower of approximately 150 statewide. Perhaps one-third will be technical personnel."

h. "As a result of RCRA (PL 94-580), the number of solid waste management jobs could easily double in the next few years. Private companies could increase their employees substantially also."

i. "With the addition of the new Public Law 94-580, manpower needs will have a major increase."

j. "Could expand greatly if Public Law 94-580 implementation proceeds."

"The EPA is attempting to bring our waste disposal program into compliance with PL 94-580. This involves initiating and amending legislation, obtaining adequate funding and structuring our administrative program. It is complex and time consuming. If we are successful, an additional manpower need would not be less than 20 technical persons."

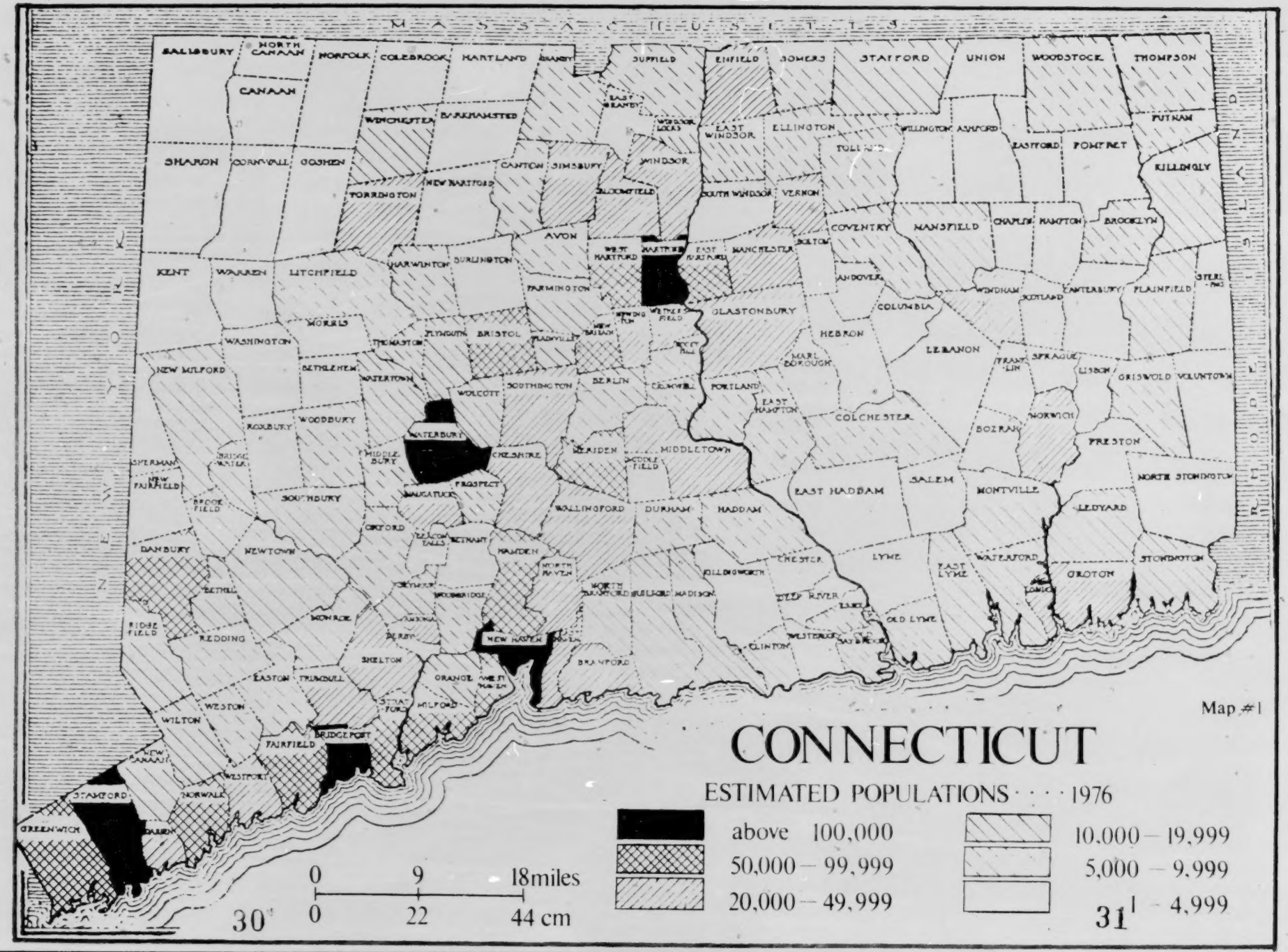
k. "The need for positions in the field of solid waste management will undoubtedly grow in the next several years, particularly in the specialized areas of resource recovery, leachate treatment, hazardous wastes, market development and source reduction."

l. "Additional staffing is required now to meet the new mandates placed on the division of solid waste management by the Resources Conservation and Recovery Act of 1976."

m. "In the future and if a Resource Recovery Public Policy is implemented in Puerto Rico, there will be a need for trained personnel in the fields of hazardous and toxic waste, resource recovery systems and solid waste management."

"There is a need for chemical engineers and environmental health technicians to handle hazardous and toxic waste (planning, technical aid and enforcement). Also this personnel should receive training on storage, collection, transportation, processing and final disposal of hazardous waste. There is also a need for personnel with expertise in resource recovery, especially in the areas of systems analysis, economics and optimizing solid waste."

n. "Over the period of the next five years, the manpower needs of the Division of Solid Waste Management of the Texas Department of Health Resources will grow from 35 to 70 persons. As this Department grows, our increased regulatory requirements upon the local sector will cause the manpower needs for disposal site operators and managers and disposal facility engineering consultants to increase. The Texas Water Quality Board also has solid waste management duties for the State and will increase its manpower over the next five years."


MASSACHUSETTS
NEW YORK
RHODE ISLAND
SALISBURY
NORTH CANAAN
NORFOLK
COLEBROOK
HARTLAND
BARKHAMSTED
CANAAN
WINCHESTER
SHARON
CORNWALL
GOSHEN
TORRINGTON
NEW HARTFORD
CANTON
SIMSBURY
AVON
BLOOMFIELD
WINDSOR
SUFFIELD
EAST GRANBY
WINDSOR LOCKS
EAST WINDSOR
ENFIELD
SOMERS
STAFFORD
UNION
WOODSTOCK
THOMPSON
ELLINGTON
TOLLAND
WILLINGTON
ASHFORD
EASTFORD
PUTNAM
POMFRET
KILLINGLY
SOUTH WINDSOR
VERNON
COVENTRY
MANSFIELD
CHAPLIN
HAMPTON
BROOKLYN
BOLTON
MANCHESTER
EAST HARTFORD
WEST HARTFORD
HARTFORD
KENT
WARREN
LITCHFIELD
HARWINTON
BURLINGTON
FARMINGTON
ANDOVER
WINDHAM
SCOTLAND
CANTERBURY
PLAINFIELD
GLASTONBURY
COLUMBIA
HEBRON
LEBANON
MARLBOROUGH
SPRAGUE
FRANKLIN
LISBON
GRISWOLD
VOLUNTOWN
WASHINGTON
MORRIS
THOMASTON
PLYMOUTH
BRISTOL
PLAINVILLE
NEW BRITAIN
ROCKY HILL
NEW MILFORD
BETHLEHEM
WATERTOWN
BERLIN
CROMWELL
PORTLAND
EAST HAMPTON
COLCHESTER
NORWICH
BOZRAH
PRESTON
NORTH STONINGTON
WOLCOTT
SOUTHINGTON
ROXBURY
WOODBURY
WATERBURY
MIDDLEBURY
CHESHIRE
MERIDEN
MIDDLETOWN
KENSINGTON
SHERMAN
NEW FAIRFIELD
BRIDGEWATER
BROOKFIELD
PROSPECT
NAUGATUCK
SOUTHBURY
WALLINGFORD
DURHAM
HADDAM
EAST HADDAM
SALEM
MONTVILLE
LEDYARD
OXFORD
BEACON FALLS
DANBURY
NEWTOWN
BETHANY
HAMDEN
NORTH HAVEN
CHESTER
LYME
EAST LYME
WATERFORD
GROTON
STONINGTON
BETHEL
WOODBRIDGE
NORTH BRANFORD
GUILFORD
MADISON
KILLINGWORTH
ESSEX
OLD LYME
RIDGEFIELD
MONROE
REDDING
DERBY
NEW HAVEN
CLINTON
WESTBROOK
SAYBROOK
SHELTON
BRANFORD
EASTON
TRUMBULL
ORANGE
WEST HAVEN
STRATFORD
MILFORD
WESTON
WILTON
FAIRFIELD
BRIDGEPORT
NEW CANAAN
WESTPORT
STAMFORD
NORWALK
GREENWICH
DARIEN
0 9 18miles
0 22 44 cm
30
31
CONNECTICUT
ESTIMATED POPULATIONS · · · · 1976
above 100,000
50,000 – 99,999
20,000 – 49,999
10,000 – 19,999
5,000 – 9,999
1 – 4,999

Map #1

Grouping of Connecticut Towns According to Population

Group 1
Population above 100,000
5 towns
Bridgeport
Hartford
New Haven
Stamford
Waterbury

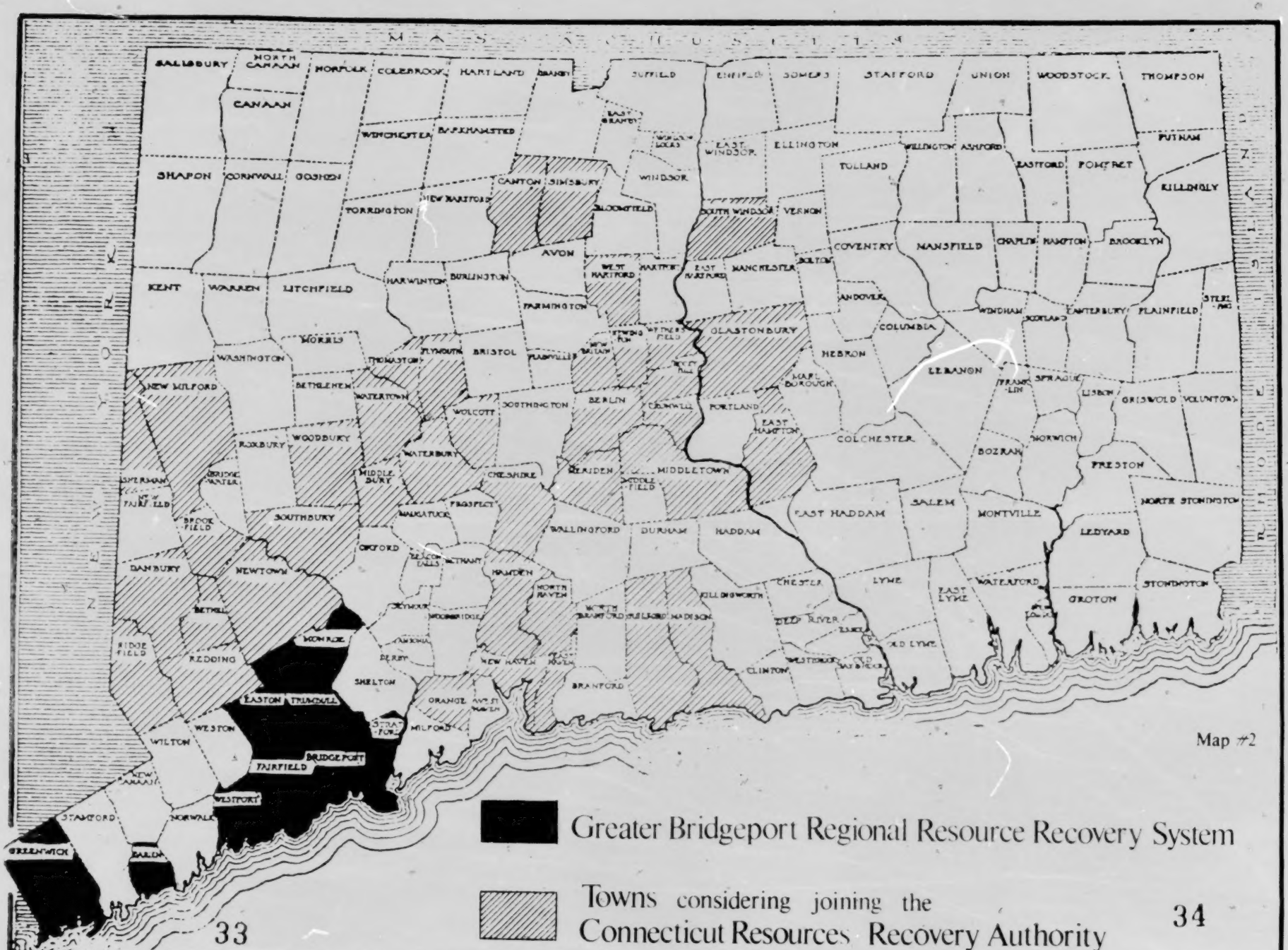
Group 2
Population 50,000-99,999
13 towns
Bristol
Danbury
East Hartford
Fairfield
Greenwich
Hamden
Meriden
Milford
New Britain
Norwalk
Stratford
West Hartford
West Haven

Group 3
Population 20,000-49,999
27 towns
Ansonia
Bloomfield
Branford
Cheshire
Darien
East Haven
Enfield
Glastonbury
Groton
Manchester
Middletown
Naugatuck
Newington
New London
North Haven
Norwich
Shelton
Simsbury
Southington
Torrington
Trumbull
Vernon
Wallingford
Westport
Wethersfield
Windham
Windsor

Group 4
Population 10,000-19,999
32 towns
Berlin
Bethel
Clinton
East Lyme
Farmington
Guilford
Killingly
Ledyard
Madison
Mansfield
Monroe
Montville
New Canaan
New Milford
Newtown
North Branford
Orange
Plainfield
Plainville
Plymouth
Ridgefield
Rocky Hill
Seymour
Southbury
Stafford
Stonington
Waterford
Watertown
Wilton
Winchester
Windsor Locks
Wolcott

Group 5
Population 5,000-9,999
36 towns
Avon
Brooklyn
Canton
Colchester
Coventry
Cromwell
Durham
East Haddam
East Hampton
Easton
East Windsor
Ellington
Essex
Granby
Griswold
Haddam
Harwinton
Litchfield
Middlebury
New Fairfield
Old Lyme
Old Saybrook
Oxford
Portland
Prospect
Putnam
Redding
Somers
Suffield
Thomaston
Thompson
Tolland
Weston
Woodbridge
Woodbury
Woodstock

Group 6
Population 1,000-4,999
54 towns
Andover
Ashford
Barkhamsted
Beacon Falls
Bethany
Bethlehem
Bolton
Bozrah
Bridgewater
Burlington
Canaan
Canterbury
Chaplin
Chester
Colebrook
Columbia
Cornwall
Deep River
Derby
Eastford
East Granby
Franklin
Goshen
Hampton
Hartland
Hebron
Kent
Lebanon
Lisbon
Lyme
Marlborough
Middlefield
Morris
New Hartford
Norfolk
North Canaan
North Stonington
Pomfret
Preston
Roxbury
Salem
Salisbury
Scotland
Sharon
Sherman
South Windsor
Sprague
Sterling
Union
Voluntown
Warren
Washington
Westbrook
Willington


MASSACHUSETTS
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SUFFIELD
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SOMERS
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THOMPSON
EAST WINDSOR
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TOLLAND
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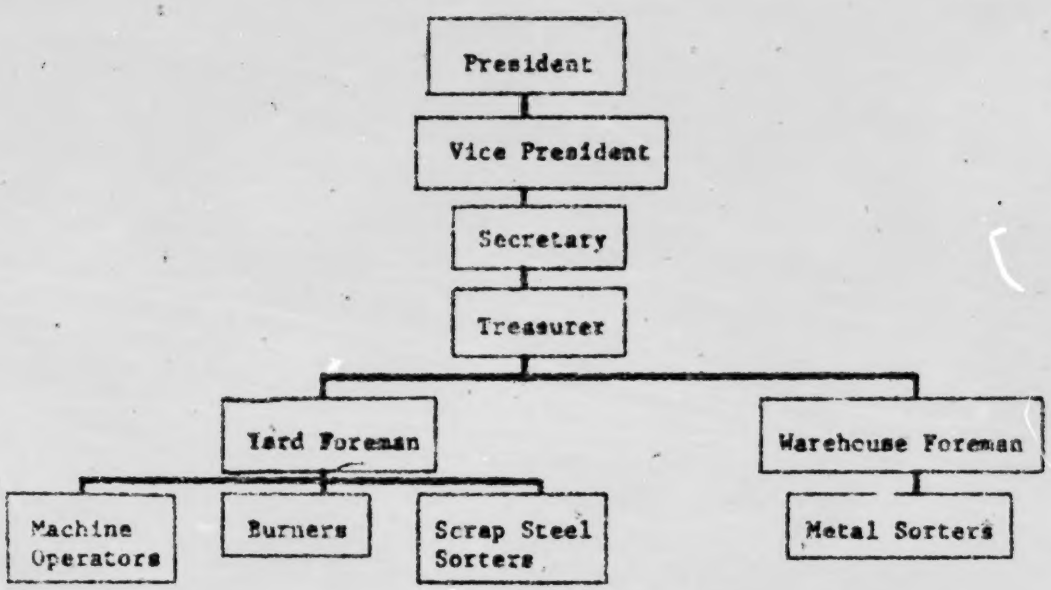
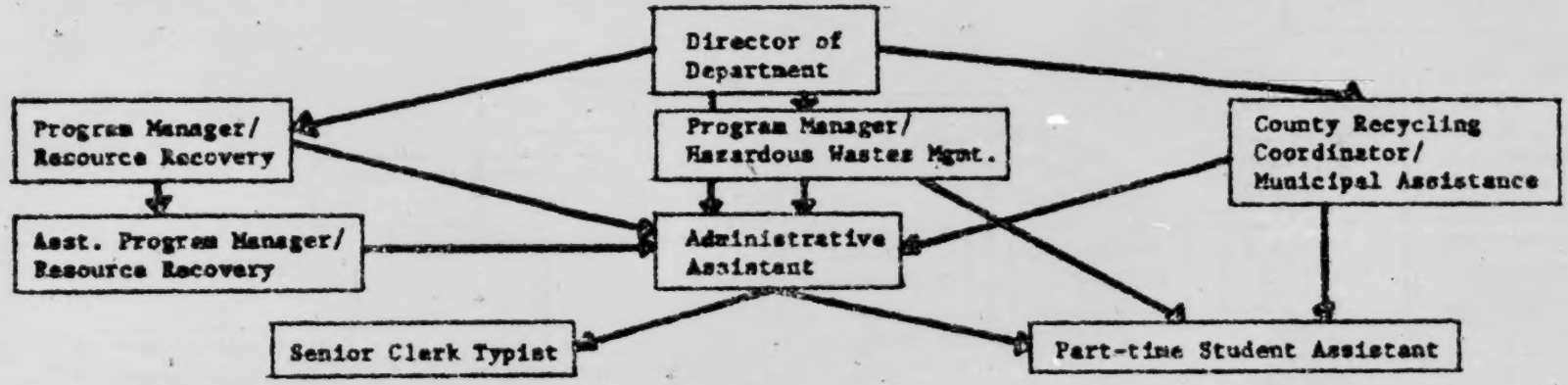
WINDHAM
SCOTLAND
CANTERBURY
PLAINFIELD
STERLING
GLASTONBURY
COLUMBIA
MORRIS
WASHINGTON
PLYMOUTH
THOMASTON
BRISTOL
PLAINVILLE
NEW BRITAIN
WETHERSFIELD
ROCKY HILL
HEBRON
LEBANON
FRANKLIN
SPRAGUE
LISBON
GRISWOLD
VOLUNTOWN
NEW MILFORD
BETHLEHEM
WATERTOWN
WOLCOTT
SOUTHINGTON
BERLIN
CROMWELL
PORTLAND
MARLBOROUGH
EAST HAMPTON
COLCHESTER
BOZRAH
NORWICH
PRESTON
ROXBURY
WOODBURY
WATERBURY
MIDDLEBURY
CHESHIRE
MERIDEN
MIDDLETOWN
MIDDLEFIELD
SHERMAN
NEW FAIRFIELD
BRIDGEWATER
BROOKFIELD
SOUTHBURY
MARKHAM
PROSPECT
WALLINGFORD
DURHAM
HADDAM
EAST HADDAM
SALEM
MONTVILLE
LEDYARD
NORTH STONINGTON
OXFORD
BEACON FALLS
BETHANY
NAUGATUCK
DANBURY
NEWTOWN
NORTH HAVEN
CHESTER
LYME
EAST LYME
WATERFORD
GROTON
STONINGTON
KILLINGWORTH
SEYMOUR
WOODBRIDGE
NORTH BRANFORD
GUILFORD
MADISON
BETHEL
MONROE
DEEP RIVER
ESSEX
OLD LYME
RIDGEFIELD
REDDING
ANSONIA
DERBY
NEW HAVEN
EAST HAVEN
WESTBROOK
OLD SAYBROOK
CLINTON
SHELTON
BRANFORD
EASTON
TRUMBULL
ORANGE
WEST HAVEN
STRATFORD
MILFORD
WESTON
WILTON
BRIDGEPORT
FAIRFIELD
NEW CANAAN
WESTPORT
STAMFORD
NORWALK
GREENWICH
DARIEN
Map #2
Greater Bridgeport Regional Resource Recovery System
Towns considering joining the
Connecticut Resources Recovery Authority
33
34

FLOW CHART OF

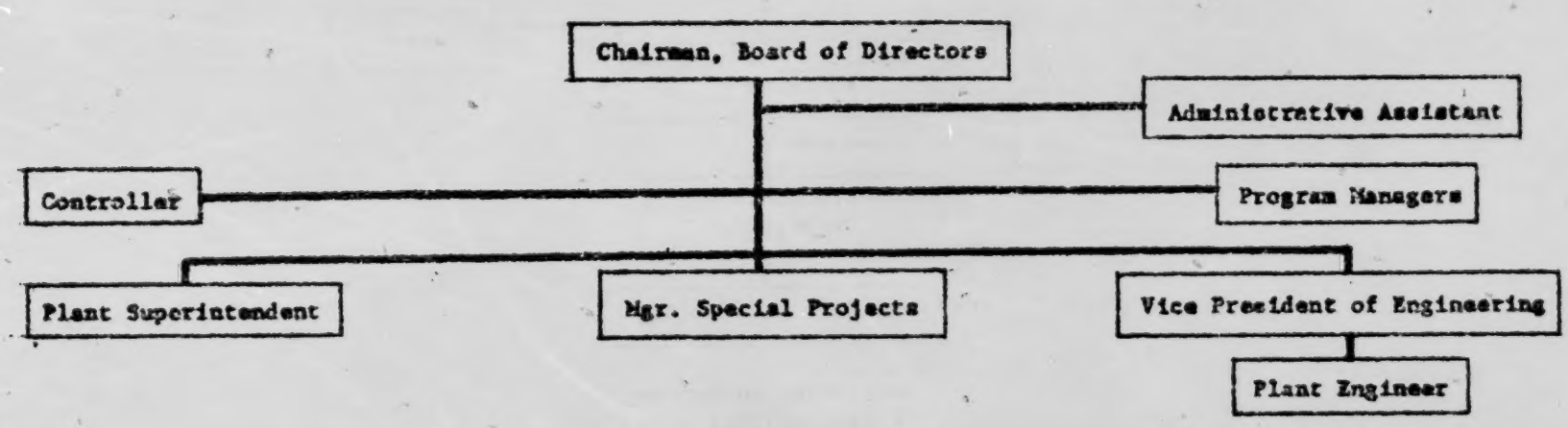
A hide and metal company in South Dakota



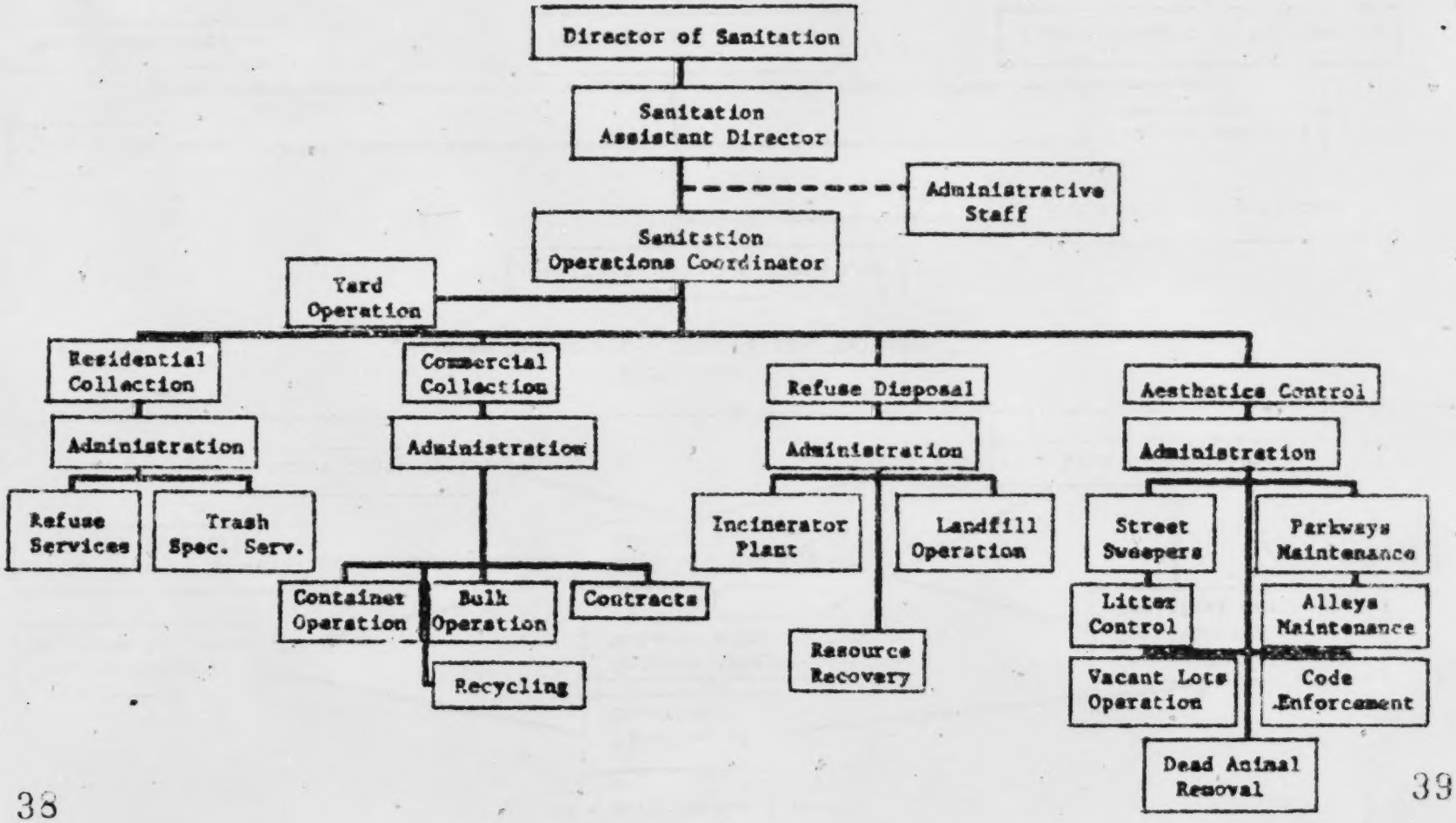
RESOURCE RECOVERY FLOW CHART
of a city in New Jersey



FLOW CHART
Private Resource Co., New Castle, Delaware



FLOW CHART
of a Florida city's
Sanitation Department



FLOW CHART
of a Transfer Station in a city in Ohio

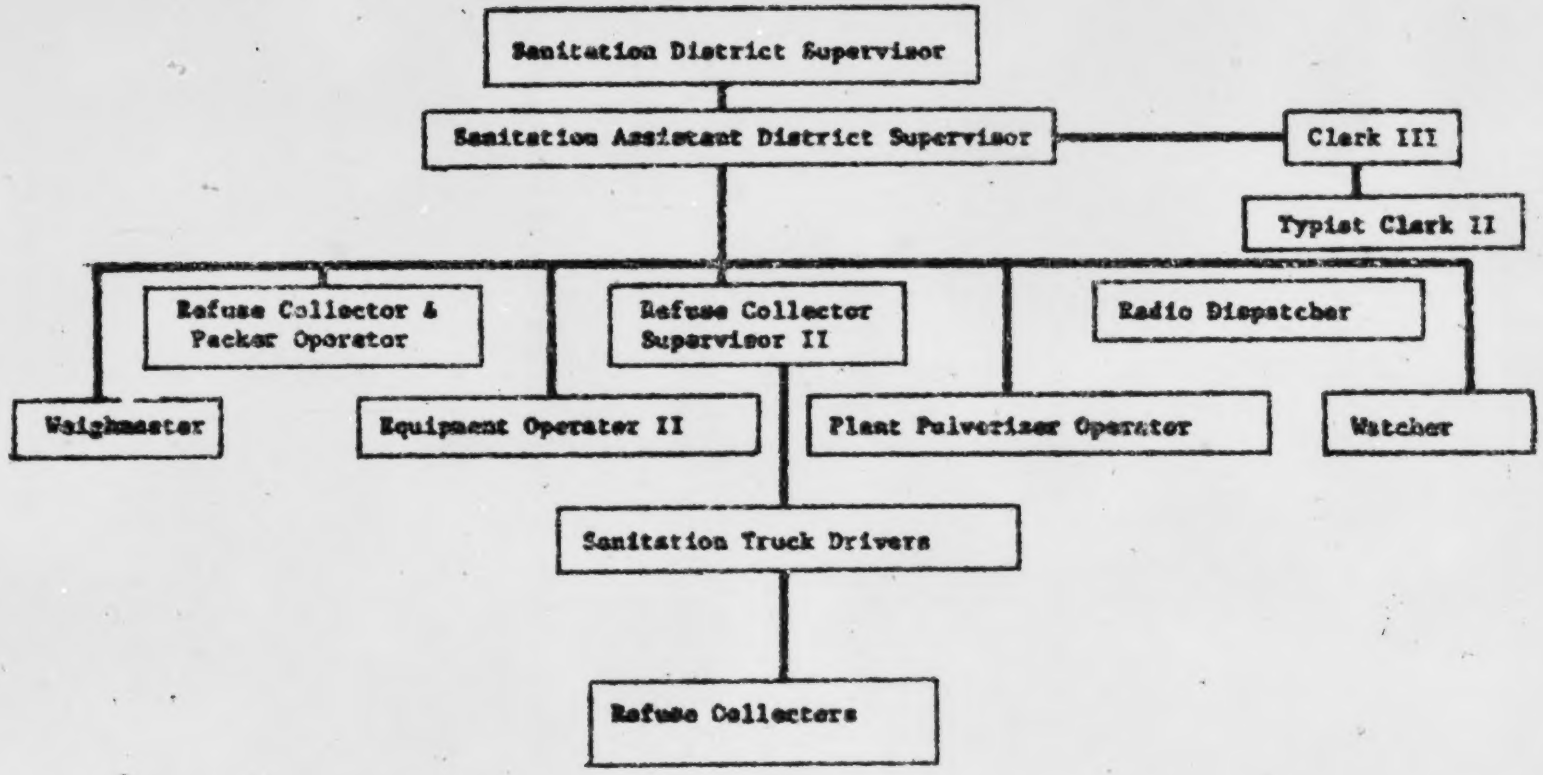


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TABLE 1

RESPONSES TO SURVEY QUESTIONNAIRES
DURING THE PERIOD FROM APRIL 1 THROUGH JUNE 10, 1977

STATE OF CONNECTICUT

Type	Sent	Returned Insufficient Address	Returned Questionnaire	%
Municipalities	166	0	89	53
Waste Paper Dealers	39	3	16	44
Resource Recovery	1	0	1	100
Scrap Metal Dealers	107	7	25	25
Junk Yard Owners	149	14	46	33
Composting	1	0	1	100
**State Agency	1	0	1	100
Total	464	24	179	

NATIONWIDE (Outside Connecticut)

Sanitation Industry	108	0	18	16
*Resource Recovery	118	11	41	38
Scrap Metal Dealers	246	5	23	9
Composting	9	5	3	75
State Agencies	59	0	34	57
Total	540	21	119	
* Private companies	59	5	18	33
Municipalities	59	6	23	43

** The report from the State of Connecticut, received after compilation of data was completed, is included in the appendix

TABLE 2

SOLID WASTE MANAGEMENT OPERATIONS IN CONNECTICUT MUNICIPALITIES

Operation	Over 20,000 Population	Under 20,000 Population	Total
Operate landfills	15	37	52
Operate incinerators	4	1	5
Do recycling*	9	10	19
Do composting	1	0	1
Belong to Regional District	-	5	5
Use transfer stations	4	2	6
Use facilities of other towns	-	13	13
Use private contractors and collectors	7	23	30
Considering joining C.R.R.A.	14	24	38
Future uncertain	2	6	8

*Most recycling run by private agencies or volunteer groups such as Boy Scouts

TABLE 3

CURRENT AND PROJECTED EMPLOYMENT BY JOB TITLES IN CONNECTICUT MUNICIPALITIES

Occupation	Pop. over 20,000 C.E.*Apr*77	Expected Emp. 2 yrs	5 yrs	Pop. under 20,000 C.E.*Apr'77	Expected Emp. 2 yrs	5 yrs	Total
Sanitary Landfill							
Foreman	10	5	5	113	21	39	123
Bulldozer oper.	23	14	15	41	64	75	64
Gateman	12	6	5	19	-	-	31
Scaler	7	4	5	1	-	-	8
Supt. or Mgr.	9	-	-	13	-	-	22
Other	1	-	-	-	-	-	1
Incinerator**							
Foreman	5	-	-	-	-	-	5
Plant oper.	4	-	-	-	-	-	4
Crane oper.	7	-	-	-	-	-	7
Maint. Mech.	5	-	-	-	-	-	5
Ashblower oper.	5	-	-	-	-	-	5
Equip. oper.	5	-	-	-	-	-	5
Maint. man	1	-	-	-	-	-	1
Scaler	1	-	-	-	-	-	1
Other	16	-	-	-	-	-	16
Supt. or Mgr.	4	-	-	-	-	-	4
Clerk	1	-	-	-	-	-	1
Composting							
Truck drivers	3						3
Laborers	3						3
Machine oper.	1						1
Recycling							
Equip. oper	1						1
Packers	3						3
Sorters	7						7
Quality control	2						2
Supt. or Mgr.	-						-
Clerk	-						-
Collection							
Foreman	15	6	9	-	-	-	15
Truck drivers	76	20	35	-	-	-	76
Laborers	188	-	-	-	-	-	188
Supervisor	3	-	-	-	-	-	3
Asst. Supv.	2	-	-	-	-	-	2

* Current Employment

** Some incinerators to close and go to other methods. Only one small town had an incinerator.

TABLE 4

SKILL TRAINING DATA REPORTED BY RESPONDING CONNECTICUT MUNICIPALITIES

Type of Training Received by Current Employees	Number of Employees
On-the-job	54
Manufacturer's or industrial training school	4
Consultant's training school	2
Technical school or college	6
Other DEP courses	31
None involved	2

TABLE 5

EDUCATIONAL LEVEL OF SOLID WASTE MANAGEMENT EMPLOYEES
IN RESPONDING CONNECTICUT MUNICIPALITIES

Level of Education	Number of Employees
High school diploma	133
Two year college degree	10
Four year college degree	15
No degree or diploma	48

TABLE 6

COURSES PREFERRED BY MUNICIPALITIES FOR UPGRADING THE SKILL OF THEIR EMPLOYEES
ENGAGED IN SOLID WASTE OCCUPATIONS

Course Types	Municipalities Responding
College Curriculum:	
Geology and soil science	29
Chemistry and industrial process technology	12
Civil engineering	15
Highway and building construction	8
Mechanical design	8
Computer science	5
Economics, accounting and assessment	14
Administration and planning	19
First aid and safety training	22
Short Training Courses:	
Sanitary landfill	35
Incinerators	4
Resource recovery	32
Composting	19
Others	8*

* 3 wanted OSHA courses on first aid, safety and supervision; 2 wanted courses on more efficient collections.

TABLE 7

CURRENT AND PROJECTED EMPLOYMENT BY JOB TITLES
OF RESPONDING CONNECTICUT WASTE PAPER DEALERS

Occupation	Current Employment April 1977	Expected Level 2 years	5 years
Facilities			
Truck drivers	47	48	52
Forklift operators	18	19	19
Bobcat operators	9	10	11
Scale operators	14	9	9
Foremen	12	14	11
Management			
Manager	8	8	8
Bookkeeper	9	9	9
Secretary	4	4	4
Sales representative	10	10	10

N.B. Projected figures not too meaningful because some dealers did not report expected level of employment for 2 years and 5 years. This table reflects only the reported figures.

TABLE 8

COURSES PREFERRED BY RESPONDING CONNECTICUT WASTE PAPER
DEALERS FOR UPGRADING THE SKILLS OF THEIR EMPLOYEES

Short Training Courses:	Waste Paper Dealers Responding
Basic math	3
English (effective speech)	3
Truck driver's license	3
Mechanical drawing	1
Recycling	1

TABLE 9

EDUCATIONAL LEVEL OF EMPLOYEES OF RESPONDING CONNECTICUT WASTE PAPER DEALERS

Level of Education	Number of Employees
High school diploma	39
Two year college degree	6
Four year college degree	7
No degree or diploma	10

A new resource recovery plant is being built in Bridgeport for the Connecticut Resources Recovery Authority. The following report has been compiled, at our request, by Combustion Equipment Associates, Inc. of New York, N. Y., designers, builders and operators of the facility.

TABLE 10

MAIN RECOVERY PLANT

Job Classification	# per week Bridgeport,Ct (1800 TPD capacity)	# per week E. Bridgewater,Mass. (1200 TPD capacity)
A-Superintendent (Plant Chief Engineer)	1	1
B-Shift supervisors	7	4
C-Weighmaster & Traffic Director	6	4
D-Safety & Compliance Personnel	3	1
E-Front End Loader Operators	6	4
F-Shredder Operators	6	4
G-Maintenance Personnel	15	7
H-Laborers	21	12
I-Mt'l Handlers & Vehicle Operators	12	2
J-Control Room Operators	6	4
K-Boiler Operators	5	4
L-Refuse Pickers	7	4
Total	95	51

Seven Bridgeport, Ct.Transfer Station Systems (Operational 8 hrs/day,6 days/wk)

Job Classification	# per week
A-Shift Supervisors	7
B-Helper (assistant)	7
C-Traffic Director	4
D-Transfer Vehicle Drivers	7
	25

The above does not include security guards, exterior groundskeeper, secretarial help, vehicle maintenance, etc. A final operating plan, which will include the pay scales personnel requirements per operating shift and other pertinent sub-systems will be included in the Operations Manual which will be updated periodically during the operating term.

The above manpower estimates can handle MSW input tonnage as shown. Additional personnel will be required at higher capacity levels.

TABLE 11

RESOURCE RECOVERY PLANT, BRIDGEPORT, CONN

Prepared by Combustion Equipment Associates, Inc., New York, N.Y.

Type of Occupation (List job titles)	Current Employment April 1977	Level of Employment 2 years	Level of Employment 5 years	Approximate Annual Salary	Education or Training Needed High School	College	Tech. School	On-the-Job
A. Management								
Superintendent	2	3	8	18,500	yes	preferred	yes	yes
Shift Super.	7	12	20	16,000	yes	preferred	yes	yes
Assistant	3	10	15	14,000	yes	some	yes	yes
B. Operators								
Weighmaster	4	10	25	13,000	yes	no	yes	yes
Safety Personnel	3	6	10	12,000	yes	no	yes	yes
Front End Loader	4	10	16	13,500	yes	no	yes	yes
Shredder	4	10	16	12,000	yes	no	yes	yes
Maintenance	9	25	40	14,000	yes	no	yes	yes
Mat'l Handlers	2	26	38	11,500	yes	no	yes	yes
Control Room	4	12	24	15,000	yes	no	yes	yes
Boiler	4	15	20	14,000	yes	no	yes	yes
Traffic Dec.	2	6	12	10,000	yes	no	yes	yes
Vehicle Drivers	6	14	20	17,000	yes	no	yes	no
C. Labor								
Refuse Pickers	4	18	28	8,000	no	no	no	yes
Gen'l Laborers	14	38	51	8,000	no	no	no	yes

N.B. The agency reports that the areas of employment with the greatest difficulty in finding qualified personnel are in management, especially the position of Superintendent (Plant Chief Engineer)

TABLE 12

CURRENT AND PROJECTED EMPLOYMENT BY JOB TITLES AND APPROXIMATE SALARY IN CONNECTICUT SCRAP METAL INDUSTRY RESPONDENTS

Occupation	C.E.*	L.E.** Expected 2 years	L.E.** Expected 5 years	Approximate Salary
A. Labor				
Bulldozer operators	5	6	6	$9,000-12,000
Burners	20	21	25	7,000-12,000
Crane operators	24	25	28	9,000-15,000
Fragmentizer oper.	1	2	2	12,500
Furnace operators	9	10	10	11,500
Lift truck oper.	25	19	23	8,000-11,500
Press operators	14	10	13	6,500-11,500
Shear operators	11	7	10	6,500-11,000
Truck drivers	69	65	35	6,000-11,500
Other equip. oper.	8	11	17	11,500
Metal sorters	44	35	27	8,000-11,500
Electricians	-	-	1	-
Mechanics	15	-	-	9,000-15,000
Other maint. pers.				6,000-11,500
B. Management				
Buyers	25	20	22	6,000-24,000
Dispatchers	12	9	9	6,000-17,000
General clerical	29	26	23	6,000-9,000
Maint. mgmt.	16	21	16	8,800-19,000
Marketing pers.	4	9	12	16,000-20,000
Prod. Control supv.	7	9	9	16,000-18,000
Production mgmt.	10	9	9	14,000-18,000
Scale operators	11	5	6	12,000-17,000
Technical pers.	1	1	2	18,000-22,000
Other personnel	11	11	15	6,000-25,000

* Current employment April 1977
** Level of employment

TABLE 13

EDUCATIONAL LEVEL REQUIRED BY CONNECTICUT SCRAP METAL INDUSTRY RESPONDENTS

Level of Education	Labor	Management	Total
High school	23	21	44
College	4	16	20
Technical school	11	2	13
On-the-job	214	90	304

TABLE 14

AREAS WHERE THERE IS THE GREATEST DIFFICULTY IN FINDING QUALIFIED PERSONNEL IN THE CONNECTICUT SCRAP METAL INDUSTRY

Type of Employment	Jobs
Labor	Metal sorters and mechanics
Management	Marketing and yard managers

TABLE 15

CURRENT EMPLOYMENT AND APPROXIMATE SALARY OF CONNECTICUT JUNK YARD INDUSTRY RESPONDENTS

Occupation	Current Employment Apr '77	Approximate Salary
Management personnel	32	$18,000-20,000
Clerical	13	8,500
Auto flatteners	3	-
Burners	5	-
Crane operators	5	-
Laborers	50	7,800-8,000
Maintenance personnel	7	13,000
Truck drivers	23	8,500
Any other	15	8,000-11,000

TABLE 16

JOB OPPORTUNITIES EXPECTED TO EXPAND SIGNIFICANTLY IN THE FUTURE IN THE CONNECTICUT JUNK YARD INDUSTRY

Future Employment	Job Opportunities
2 years	Burners, delivery of molten aluminum, equipment operators, metal sorters, metallurgists, the brokerage business, skilled labor, yard labor
5 years	Same as above

TABLE 17

AREAS WHERE THERE IS THE GREATEST DIFFICULTY IN FINDING QUALIFIED JUNK YARD PERSONNEL

Type of Employment	Jobs
Labor	General laborers, crane operators, maintenance mechanics, burners, sorters, production workers, yard workers
Management	Foremen, clerical help, traders (buyers and brokers)

TABLE 18

CURRENT EMPLOYMENT IN THE COMPOSTING INDUSTRY IN CONNECTICUT

Operation - Private corporation	Current Employment
Occupation: Foreman	1
Equipment operator	2
Plant laborer	1

Table 19

CURRENT AND PROJECTED EMPLOYMENT BY OCCUPATIONAL CATEGORY AND APPROXIMATE SALARY OF SOLID WASTE SANITATION INDUSTRY RESPONDENTS

Occupation*	C.E.**	L.E.*** Expected 2 years	5 years	Approximate Salary
Labor	115	238	438	$10,000-15,000
Management	118	84	78	7,500-35,000

* Labor - electricians, welders, fitters, painters, equipment operators, production workers and laborers
Management - engineers, draftsmen, estimators, salesmen, managers, purchasing agents, accountants, clerical and others

** Current employment April 1977 *** Expected level of employment

TABLE 20

CURRENT AND PROJECTED EMPLOYMENT BY JOB TITLES AND APPROXIMATE SALARY IN SAMPLE RESPONDENTS IN MUNICIPAL RESOURCE RECOVERY OPERATIONS

Occupation	C.E.*	L.E.** Expected 2 years	5 years	Approximate Salary
A. Labor				$12,480-16,972
Foreman	40	40	41	$12,480-16,972
Maint. Technician	14	16	19	13,000
Welder	1	1	1	13,650
Mechanic	3	4	4	13,000-15,474
Equipment operator	54	55	56	8,200-18,000
Other	170	169	189	7,956-23,500
Truck driver	98	98	99	9,000-11,045
Collector	1258	1259	1259	9,000-13,624
Laborer	109	113	136	7,270-12,927
B. Management				
Supt., Dir. or Comm.	21	21	22	13,900-34,000
Suprv. or Admin.	37	37	37	13,000-25,000
Tech. engineer	11	12	13	14,800-16,000
Clerical	24	24	24	7,360-13,000
Other	-	2	2	17,000

* Current employment April 1977 ** Level of employment

TABLE 21

CURRENT AND PROJECTED EMPLOYMENT BY JOB TITLES AND APPROXIMATE SALARY IN SAMPLE FIRMS IN PRIVATE RESOURCE RECOVERY INDUSTRY

Occupation	C.E.*	L.E.** Expected 2 years	5 years	Approximate Salary
A. Labor				
Welders-mechanics	6	6	6	$11,000
Laborers	20	32	72	9,000
B. Management				
Administrators	9	10	12	12,000-39,000
Project mgmt & engr	34	54	204	16,000-35,000
Development	12	20	30	15,000
Sales	9	12	15	16,000

* Current employment April 1977 ** Level of employment

TABLE 22

AREAS WHERE THERE IS THE GREATEST DIFFICULTY IN FINDING QUALIFIED RESOURCE RECOVERY PERSONNAL

Type of Employment	Jobs
Labor	Skilled mechanics, electrical and mechanical personnel, foremen, equipment operators
Management	Supervisors, technical managers, program and plant managers for resource recovery and hazardous waste management facilities

TABLE 23

JOB OPPORTUNITIES EXPECTED TO EXPAND SIGNIFICANTLY IN THE FUTURE IN RESOURCE RECOVERY INDUSTRY

Future Employment	Job Opportunities
Two years	Maintenance operators, technical positions, program and plant managers for resource recovery and hazardous waste management facilities
Five years	Environmental engineering, technical and supervisory positions

TABLE 24

CURRENT EMPLOYMENT BY JOB TITLES AND APPROXIMATE SALARY
IN RESPONDING SCRAP METAL FIRMS (Outside Connecticut)

Occupation	C.E.*	L.E.** Expected 2 years	L.E.** Expected 5 years	Approximate Salary
A. Labor				
Bulldozer operators	7	5	5	$5,000-15,000
Burners	88	74	83	5,000-10,000
Crane operators	61	51	36	5,000-15,600
Fragmentizer oper.	9	13	5	6,800
Furnace operators	27	29	14	5,000-14,500
Lift truck operators	65	74	16	5,000-10,000
Press operators	28	27	25	5,000-10,000
Shear operators	33	23	29	5,000-10,000
Truck drivers	51	54	38	5,000-15,000
Other equip. oper.	27	30	24	5,000-14,500
Metal sorters	120	110	96	6,800-11,600
Electricians	12	14	10	8,400-12,000
Mechanics	58	39	18	5,200-18,000
Other maint. pers.	72	28	11	7,000-12,400
B. Management				
Buyers	53	32	27	8,000-20,000
Dispatchers	13	16	4	8,000-18,000
General clerical	43	62	35	5,800-15,000
Maint. management	13	12	8	5,200-25,000
Marketing personnel	10	12	8	16,000-25,000
Prod. Control supv.	12	17	7	14,000-20,000
Production management	27	26	9	11,000-25,000
Scale operators	34	35	29	7,600-15,000
Technical personnel	15	13	7	9,000-14,500
Other personnel	21	21	9	9,500

* Current employment April 1977 ** Level of employment

TABLE 25

EDUCATIONAL LEVEL OF EMPLOYEES IN RESPONDING SCRAP METAL FIRMS
(Outside Connecticut)

Level of Education	Labor	Management	Total
High school	12	13	25
College	2	11	13
Technical school	8	7	15
On-the-job	12	14	26

TABLE 26

CURRENT AND PROJECTED EMPLOYMENT BY JOB TITLES AND APPROXIMATE SALARY IN SAMPLE COMPOSTING FIRMS (Outside Connecticut)

Operation - Municipal Solid Waste Collection

Occupation	C.E.*	L.E.** Expected 2 years	5 years	Approximate Salary
Foreman	3	3	3	$10,000-12,000
Assistant foreman	3	3	3	9,000-10,000
Equipment operators	14	14	14	6,880
Truck drivers	36	36	36	7,702
Other plant oper.	125	125	125	7,006

* Current employment April 1977 ** Level of Employment

TABLE 27

PROFESSIONS REPRESENTED IN RESPONDING STATE SOLID WASTE MANAGEMENT AGENCIES WITH TOTAL PROJECTED NEED

Profession	Number of Employees	Expected in 5 years
Engineers	31	-
Attorneys	15	-
Administrators	19	-
Clerical	27	-
Computer specialists	6	-
Accountants, consultants	5	-
Technicians	21	-
Other (Sanitarians, geologists, environmental health specialists, chemists, research scientists)	20	-
Total	144	689*

* No. of employees expected in 5 years was a separate question; total was not broken down into categories

TABLE 28

HOW EMPLOYMENT NEEDS ARE MET BY STATE SOLID WASTE MANAGEMENT AGENCIES

Method	State Agencies
Hire off the street	4
Recruit from college and technical school	15
Employment services	5
State Civil Service	13

TABLE 29

INFORMATION FURNISHED BY STATE AGENCIES CONCERNING CURRENT AND PROJECTED SOLID WASTE DISPOSAL FACILITIES WITH JOB TITLES AND AVERAGE NUMBER OF EMPLOYEES

Facility	Current Number	Expected to Open in 5 years	Average # Employees
Sanitary Landfills (Supt., site manager, engineer, bookkeeper, gatekeeper, equipment operator, weighmaster, laborer)	5311	1598	3
Incinerators (Supt., plant engineer, technician, crane operator, scale master, laborer)	74	28	3
Composting	7	24	5
Municipal sludge	4	-	-
Sewage sludge (Manager, equipment operator, engineer, truck driver, maintenance man, market development, laborer)	3	-	-
Resource Recovery (Supervisor, plant operator, equipment operator, mechanic, weighmaster, material handler, millwright, sales and market personnel)	19	78	12
Source Separation Centers	549	-	6
Private	393	-	-
Municipal	156	-	-
Hazardous Waste Disposal Site (Operator, treatment plant operator, truck driver, chemical engineer, biologist, hydrologist, marketing agent, technical personnel)	974	-	3

TABLE 30

TIMETABLE FOR CLOSING OPEN DUMPS

Present Number	Closed in 1976	To Be Closed by 1980
3014	988	1889

States which are included in the timetable: Alabama, Arizona, California, Connecticut, Delaware, Georgia, Hawaii, Idaho, Indiana, Iowa, Kansas, Louisiana, Maine, Minnesota, Missouri, Montana, Nebraska, Nevada, New Hampshire, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Commonwealth of Puerto Rico, Rhode Island, South Carolina, Texas, Tennessee, Vermont, West Virginia, Wisconsin and Wyoming.

REFERENCES

The following books and reference materials are used for preparing the mailing list for the survey questionnaire:

1. List of municipalities in the state and their addresses is obtained from State of Connecticut Register and Manual - 1976, Hartford 1976.

2. List of Waste Equipment Manufacturers in the nation is obtained from 1977 Sanitation Year Book published by Solid Waste Management - Refuse Removal Journal, November 30, 1976.

3. List of Resource Recovery Agencies is obtained from Resource Recovery Plant Implementation - Further Assistance compiled by Denise F. Hawkins, U.S. Environmental Protection Agency, 1975.

4. National Solid Waste Management Association's Fourth National Congress on Waste Management Technology and Resource and Energy Recovery. (Registration list) Atlanta, Georgia November 12-14, 1975.

5. List of Scrap Metal Industry dealers is obtained from the directory of members published by the Institute of Scrap Iron and Steel, Inc., 1729 H Street NW, Washington, DC 20006.

6. List of Composting Plants is obtained from "Composting of Municipal Solid Wastes in the United States" prepared by Andrew W. Breidenbach, U.S. Environmental Protection Agency, 1971.

7. Lists of Connecticut Waste Paper Dealers and Junk Yards which are prepared from telephone directories are obtained from Mr. Charles Kurker of the State Department of Environmental Protection, Hartford, Connecticut.

8. Lists of the State Solid Waste Management Agencies are obtained from 1977 Sanitation Industry Year Book published by Solid Wastes Management - Refuse Removal Journal, November 30, 1976.

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3. A Survey of Manpower and Educational Needs for Environmental Quality Control and OSHA Activities of Businesses and Industries in Connecticut. Burt R. Baldwin, Conn. Business & Industry Association, May 1974 (manuscript). 30 p.

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13. Sanitation Industry Year Book (1977) published by Solid Waste Management, November 30, 1976. 290 p.

14. Sludge Composting Project, Bangor. Prepared by City of Bangor, Maine. 24 p.

15. Survey of Needs in Environmental Health Occupations. Prepared by Conn. Labor Dept., Employment Security Div., Research and Information, March 1969 (manuscript). 19 p.

16. State of Connecticut - Solid Waste Management Plan. Prepared by Solid Wastes Section of Connecticut State Department of Health 1971. 152 p.

17. Solid Waste Management Composting - European activity and American potential. Samuel A. Hart. Public Health Service Publication No. 1826. 40 p.

18. The Economics of Resource Recovery from Municipal Solid Waste. J. G. Abert, H. Alter and J. F. Bernheisel. Science, March 1974, Vol. 183. P.1052-1058

GLOSSARY

Collection - The removal activities of solid waste materials from storage generation sources.

Composting - The conversion of organic solid wastes to stable humus-like material as byproduct through the process of controlled biochemical degradation.

C.R.R.A. - Abbreviation for Connecticut Resources Recovery Authority which was established according to State Public Act No. 73-459. The Authority primarily deals with planning, design and implementation of solid waste disposal, volume reduction and resource recovery activities.

D.E.P. - Abbreviation for Department of Environmental Protection in the State of Connecticut. The agency primarily deals with the conservation, natural resource planning, pollution control abatement programs, etc.

O.S.H.A. - OSHA refers to the William-Steiger Occupational Safety and Health Act which was passed in 1970. It is a safety law. It also refers to the Occupational Safety and Health Administration (OSHA) which develops compliance programs, executes them and also reviews the effectiveness of federal/state compliance activities.

R.C.R.A. - Abbreviation for the Resources,Conservation and Recovery Act of 1976 (P.L. 94-580).

Resource Recovery - The recovery of materials from waste is known as recycling and recently the term "resource recovery" is used for recycling. By the recycling process, the waste materials are returned to the beginning of the cycle as raw material for production of new products.

Solid Waste - Solid means a firm or compact material and waste means unwanted and discarded materials, which include solids and liquids. Solid waste thus means unwanted and discarded solids. Solid waste disposal contributes to land, water and air pollution.

Sanitary Landfill - A disposal method in which the waste materials are deposited, compacted and covered daily with at least six inches of earth material.

Technician - Technicians are individuals who are not full professionals but can perform technical tasks based on training or academic credentials. The usual tasks performed as environmental technicians are monitoring, surveillance, testing, inspection, etc. They are also known as paraprofessionals.

Transfer Station - A permitted volume reduction area where solid waste is collected, concentrated and transferred later to a sanitary landfill or a processing facility.

Turnover - "The rate at which people leave a job, resulting in a requirement for someone to fill the job" (Manpower Profile and Analysis in the Field of Solid Waste Management, Vol. I, prepared by Applied Management Science, Inc. 1973, page 6).

STATE OF CONNECTICUT
NORTHWESTERN CONNECTICUT COMMUNITY COLLEGE
PARK PLACE EAST • WINSTED, CONNECTICUT 06098
AREA CODE 203 - 379-8543

March 30, 1977

Dear Sir:

We are conducting a survey on Environmental Technician Employment Needs in Solid Waste Occupations. The Solid Waste Management unit of the Connecticut State Department of Environmental Protection is lending its support to this survey.

The survey is designed to determine the extent of current employment in the solid waste field, expected job growth in the field, needed skills for performing the job, and the type of educational background preferred by employers of solid waste technicians.

To obtain effective information regarding the current and prospective needs of employers in solid waste occupations, we are asking you to participate in this survey. It would be appreciated if you would assign the responsibility of completing the attached survey form to a person who is familiar with the current and long-range policies, plans and prospects of your organization. All information furnished us will be kept confidential and used for statistical purposes only. No individual organization will be identified.

The survey will be of vital importance to all who are interested in solid waste occupations, training and management programs. A copy of the study (abstract) will be sent to you.

Your participation in the project is sincerely appreciated.

Sincerely,

Satyakam Sen

Satyakam Sen
Associate Professor of Environmental Technology

QUESTIONNAIRE 1 - MUNICIPALITIES

TOWN: _____

SOLID WASTE SKILL SURVEY

PART I

Please furnish information requested for each occupation columns 3 through 8.

TYPE OF OCCUPATION	OCCUPATION	CURRENT EMPLOYMENT MIDWEEK OF APRIL 1977	LEVEL OF EMPLOYMENT EXPECTED 2 years	5 years	NEEDED REPLACEMENT WORKERS NEXT YEAR	EDUCATION OR TRAINING PROGRAM YES OR NO	PROMOTION TO OCCUPATION If Yes, mention number of workers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sanitary Landfill	FACILITY						
	Foreman						
	Bulldozer Operator						
	Gateman						
	Scaler						
	ORGANIZATION						
	Supt. or Manager						
	Other						
Incinerator	FACILITY						
	Foreman						
	Plant Operator						
	Crane Operators						
	ORGANIZATION						
	Maintenance mechanics						
	Ashblower Oper.						
	Equipment Oper. (bulk waste)						
	Maintenance Man (labor)						
	Scaler						
	Other						
	Gateman						
	Supt. or Mgr.						
	(Bookkeeper)						
	(Clerk)						

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Composting	FACILITY						
	Truck Drivers						
	Laborers						
	Machine Oper.						
	ORGANIZATION						
	Plant Supt.						
	Manager						
Recycling	FACILITY						
	Equipment Oper.						
	Packers						
	Sorters						
	Quality Control Mgr. or Supt.						
	Bookkeeper (clerk)						
Collection Operation	SYSTEM OPERATION						
	Foreman						
	Truck Drivers						
	Laborers						
	ORGANIZATION						

Questionnaire 1 - Municipalities

PART II

1. If you indicated changes in any of the occupations listed which might be considered significant in view of the amount of change in solid waste occupations involved (Columns 4 and 5), please express the reason for such changes (i.e. plant expansion, modernization, important technological or scientific trends, etc.) in the space below:

2. How were the skills and knowledge required for solid waste management activities in your town acquired by the employees now engaged in this work? Specify percent of employees for each type:

(1) _____ On-the-job training
(2) _____ Manufacturers or Industrial Training School
(3) _____ Consultants Training School
(4) _____ Technical School or College Education
(5) _____ Other (specify)
(6) _____ None involved

3. Does your town or organization provide support for on-the-job training of personnel involved in solid waste management activities?

Yes _____ No _____

4. If you were to have an impact on college curriculum for solid waste management needed for your organization, which disciplines would you want to include?

(1) Geology and Soil Science _____
(2) Chemistry & Industrial Process Technology _____
(3) Civil Engineering _____
(4) Highway & Building Construction _____
(5) Mechanical Design _____
(6) Computer Science _____
(7) Economics, Accounting & Assessment _____
(8) Administration and Planning _____
(9) First Aid and Safety Training _____

5. Do you feel that there is a need for short courses to improve your standards of performance involved in the following activities?

(1)	Sanitary Landfill	Yes _____	No _____
(2)	Incinerators	Yes _____	No _____
(3)	Recycling	Yes _____	No _____
(4)	Composting	Yes _____	No _____
(5)	Others (if any)	Yes _____	No _____

6. How many employees have:

High school diploma _____
Two year college degree _____
Four year college degree _____
No degrees _____

7. How do you intend to reduce the cost of energy for:
   (1) Refuse collection _____
   _____
   _____
   (2) Refuse disposal _____
   _____
   _____

8. How would you rate your priority of federal funds to solve the solid waste problems?

9. Are you willing to acquire resource recycling facilities:
   Yes _____ No _____

10. Do you want to run the resource recycling facilities by the municipality?
   Yes _____ No _____

   Private agencies?
   Yes _____ No _____

11. Are there any comments you would like to make which you feel would help us to understand more clearly the issues relating to this skill survey?

If you have any questions about the completion of this survey form, please call Dr. Satyakam Sen, 379-8543, ext. 274

Please return the survey form to:

Environmental Technology Program
Northwestern Connecticut Community College
Park Place East
Winsted, Connecticut 06098

QUESTIONNAIRE 2 - WASTE PAPER DEALERS

SOLID WASTE SKILL SURVEY

PART I

Please furnish information requested for each occupation in columns 3 through 8.

NAME: _____

TYPE OF OPERATION	OCCUPATION	CURRENT EMPLOYMENT APR 15, 1977	LEVEL OF EMPLOYMENT EXPECTED 2 years	5 years	NEEDED REPLACEMENT WORKERS NEXT YEAR	EDUCATION OR TRAINING PROGRAM YES OR NO	PROMOTION TO OCCUPATION If Yes, mention number of workers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	FACILITIES						
	Truck Drivers						
	Forklift Operators (Machine Handlers)						
	Bobcat Operators						
	Scale Operators						
	Foreman						
	ORGANIZATION						
	Manager						
	Bookkeeper						
	Secretary						
	Sales Representative						

Questionnaire 2 - Waste Paper Dealers

PART II

1. If you indicated changes in any of the occupations listed which might be considered significant in view of the amount of change in solid waste occupations involved (Columns 4 and 5), please express the reason for such changes (i.e. plant expansion, modernization, important technological or scientific trends, etc.) in the space below.

2. How were the skills and knowledge required for solid waste management activities in your company acquired by the employees now engaged in this work? Specify present percent of employees for each type.

(1) _____ On-the-job training
(2) _____ Manufacturers or Industrial Training School
(3) _____ Technical School or College Education
(4) _____ Other (specify)
(5) _____ None involved

3. Does your organization provide support for on-the-job training of personnel involved in solid waste management activities?

Yes _____ No _____

4. What type of education is required for those who work at facilities?

5. Do you feel that there is a need for short courses to improve your standards of performance involved in the following activities?

(1) Basic Math Yes _____ No _____
(2) English (effective speech) Yes _____ No _____
(3) Truck Driver's License Yes _____ No _____
(4) Mechanical Drawing Yes _____ No _____
(5) Recycling Yes _____ No _____
(6) Others (if any) Yes _____ No _____

6. How many employees have:

High school diploma _____
Two year college degree _____
Four year college degree _____
No degrees _____

7. Do you think that the increased cost of energy will influence the reduction of the number of workers?

Yes _____ No _____

8. Are there any comments you would like to make which you feel would help us to understand more clearly the issues relating to this skill survey?

If you have any questions about the completion of this survey form, please call Dr. Satyakam Sen, 379-8543, ext. 274.

Please return the survey form to:

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Northwestern Connecticut Community College
Park Place East
Winsted, Connecticut 06098

QUESTIONNAIRE 3 - SOLID WASTE SANITATION INDUSTRY (Equipment Manufacturers)

SOLID WASTE SKILL SURVEY

PART I

Please furnish the information as requested below:

Company name _____
Address _____
Equipment _____
Do you sell _____ Manufacture _____ Operate _____ this equipment?

Type of Occupation Management (List job titles)	Current Employment April 1977	Level of Employment Expected 2 years	5 years	Type of Occupation - Labor (List job titles)	Current Employment April 1977	Level of Employment Expected 2 years	5 years

PART II

Types of Occupation (List job titles)	Approximate Annual Salary	Number Employees	Education/Training Needed High School	College	Technical School	On-the-Job
A. Management						
B. Labor						

Questionnaire 3 - Solid Waste Sanitation Industry

PART III

1. Please indicate what job areas will be phased out or closed down in the future.

Within two years

Within five years

2. What job areas will be expanding in the future?

Within two years

Within five years

If you have any questions about the completion of this survey form, please call Dr. Satyakam Sen, area code 203 379-8543, ext. 274.

Please return this form to:

Environmental Technology Program
Northwestern Connecticut Community College
Park Place East
Winsted, Connecticut 06098

QUESTIONNAIRE 4 - RESOURCE RECOVERY INDUSTRY

SOLID WASTE SKILL SURVEY

PART I

Type of Occupation (List job titles)	Current Employment April 1977	Level of Employment 2 years	Expected 5 years	Approximate Annual Salary	Education or Training Needed High School	College	Tech.School	On-the-Job
A. Management								
A. Labor								

PART II

1. In what areas of employment do you find the greatest difficulty in finding qualified personnel? Please specify job titles.

Management Labor

2. What job opportunities do you expect to expand significantly in the future?

Two Years Five Years

3. Are there any comments you would like to make which you feel would help us to understand more clearly the issues relating to this study?

4. Please complete your company personnel organization chart on this sheet. If there is not sufficient space, please attach to this survey. (Original questionnaire gave a separate page)

If you have any questions about the completion of this survey form, please call Dr. Satyakam Sen, area code 203 379-8543, ext. 274.

Please return this form to:

Environmental Technology Program
Northwestern Connecticut Community College
Park Place East
Winsted, Connecticut 06098

QUESTIONNAIRE 5 - SCRAP METAL INDUSTRY

SOLID WASTE SKILL SURVEY

Company Name _____
Address _____
Type of Operation _____

PART I

Type of Occupation	Current Employment April 1977	Expected Level of Employment 2 years	5 years
A. Labor			
Bulldozer Operators			
Burners			
Crane Operators			
Fragmentizer Operators			
Furnace Operators			
Lift Truck Operators			
Press Operators			
Shear Operators			
Truck Drivers			
Other Equip. Operators			
Metal Sorters			
Electricians			
Mechanics			
Other Maint.Personnel			
B. Management			
Buyers			
Dispatchers			
General Clerical			
Maint. Management			
Marketing Personnel			
Prod. Control Suprv.			
Production Management			
Scale Operators			
Technical Personnel			
Other Personnel			

PART II

Type of Occupation	Approx. Annual Salary	No. of Employees	Education/Training Needed High School	College	Tech. School	On-the-Job
A. Labor						
Bulldozer Operators						
Burners						
Crane Operators						
Fragmentizer Operators						
Furnace Operators						
Lift Truck Operators						
Press Operators						
Shear Operators						
Truck Drivers						
Other Equip. Oper.						
Metal Sorters						
Electricians						
Mechanics						
Other Maint. Personnel						

Questionnaire 5 - Scrap Metal Industry

PART II (continued)

B. Management
Buyers
Dispatchers
General Clerical
Maint. Management
Marketing Personnel
Prod. Control Suprv.
Production Management
Scale Operators
Technical Personnel
Other Personnel

PART III

1. In what areas of employment do you find the greatest difficulty in finding qualified personnel? Please specify job titles.

Labor Management

2. What job opportunities do you expect to expand significantly in the future?

Two Years Five Years

3. Do you think a short training course on OSHA would be useful?

Yes _____ No _____

4. Are there any comments you would like to make which you feel would help us to understand more clearly the issues relating to this study?

5. Please complete your company personnel organization chart on this sheet. If there is not sufficient space, please attach to this survey. (Original questionnaire gave a separate page)

If you have any questions about the completion of this survey form, please call Dr. Satyakam Sen, area code 203 379-8543, ext. 274.

Please return this form to:

Environmental Technology Program
Northwestern Connecticut Community College
Park Place East
Winsted, Connecticut 06098

QUESTIONNAIRE 6 - JUNK YARD OWNERS

SOLID WASTE SKILL SURVEY

Name _____

Address _____

PART I

Type of Occupation	Current Employment April 1977	Expected Level of Employment 2 years	5 years	Approximate Salary
Management Personnel				
Clerical				
Auto Flatteners				
Burners				
Crane Operators				
Laborers				
Maintenance Personnel				
Truck Drivers				
Any Other				

PART II

1. Do any of your personnel need college, technical school or on-the-job training? If so, list job and courses needed.

2. Do you think a short training course on OSHA would be useful?

Yes _____ No _____

3. Are there any comments you would like to make which you feel would help us to understand more clearly the issues relating to this study?

If you have any questions about the completion of this survey form, please call Dr. Satyakam Sen, area code 203 379-8543, ext. 274.

Please return this form to:

Environmental Technology Program
Northwestern Connecticut Community College
Park Place East
Winsted, Connecticut 06098

QUESTIONNAIRE 7 - COMPOSTING INDUSTRY

SOLID WASTE SKILL SURVEY

Name _____

Address _____

Type of Occupation _____ Municipal or Private _____

PART I

Please furnish information requested for each occupation. Column (4) is optional.

Occupation	Current Employment April 1977	Level of Employment Expected 2 years	5 years	Approximate Annual Salary	Education or Training Needed High School	College	Tech.School	On-the-Job
(1)	(2)	(3)		(4)	(5)			
Foreman								
Assistant Foreman								
Equipment OPerators								
Truck Drivers								
Other Plant Laborers								
Clerk								
Lab Technician								
Other								

PART II

1. In what areas of employment do you find the greatest difficulty in finding qualified personnel? Please specify job titles.

2. What job opportunities do you expect to expand significantly in the future?

3. Are there any comments you would like to make which you feel would help us to understand more clearly the issues relating to this study?

If you have any questions about the completion of this survey form, please call Dr. Satyakam Sen, area code 203 379-8543, ext. 274.

Please return this form to: Environmental Technology Program
Northwestern Connecticut Community College
Park Place East
Winsted, Connecticut 06098

QUESTIONNAIRE 8 - STATE AGENCIES

SOLID WASTE SKILL SURVEY

Name of State _____

STATE AGENCY INFORMATION

PART I

1(a) Do you have a separate Solid Waste Management Agency? Yes ___ No ___
(b) If not, what agency or agencies handle solid waste management problems?
County _____ Municipal _____ Private _____

2. What professions do these employees represent in your agency?
a. Engineers _____
b. Attorneys _____
c. Administrators _____
d. Clerical _____
e. Computer Specialists _____
f. Accountants/Consultants _____
g. Technicians _____
h. Other

3. Has the number of employees grown or declined during the past year?

4. How many employees do you expect to need in 5 years?

5. Do you provide training programs for your employees? Yes ___ No ___
If yes, how many employees have completed these programs?

6. How do you meet your employment needs?
a. Hire off the street _____
b. Recruit from colleges and vo-tech institutes _____
c. Employment services _____
d. Labor unions _____

7. Please comment on the prospect of manpower needs in the solid waste management field.

PART II

STATEWIDE INFORMATION

A. SANITARY LANDFILLS

1. How many open dumps in your state now _____, closed during 1976 _____, to be closed by 1980 _____?

2. How many sanitary landfills in your state now _____, expected to open up in the next 5 years _____?

3. What are the average numbers of employees engaged now at each landfill _____? List job titles.

(a) Facilities (b) Management

B. INCINERATION

1. How many incinerators presently in use _____?
2. How many incinerators were closed last year _____?
3. How many are expected to close in the next 5 years _____?
4a. Is there any plan to open up new incinerators? Yes ___ No ___
b. If yes, state the number expected to open up in next 5 years. ___
5. Average number of employees at each incinerator. _____

List job titles
(a) Facilities (b) Management

C. COMPOSTING

1. How many composting plants are in your state?
Municipal Refuse Composting _____ Sewage Sludge Composting _____

2. How many are expected within 2 years _____, 5 years _____?

3. Average number of employees at each plant _____? List job titles.

4. Do you think there is a future in composting? Yes ___ No ___

D. RESOURCE RECOVERY

1. How many resource recovery plants does your state have at present ___?

2. How many do you expect within 5 years _____?

3. Average number of employees at each plant _____? List job titles.

4. How many source separation centers do you have _____?
Private _____ Municipal _____ State Owned _____

4. Average number of employees at source separation centers _____?

E. HAZARDOUS WASTE

1. Does your state have any hazardous waste sites? Yes ____ No ____
If yes, how many ____?

2. How many private companies collect and dispose of hazardous waste ___?

3. Who regulates the collection of hazardous waste?
Municipality _____ County _____ State _____

4. How many people are employed in the collection and disposal of hazardous waste _____? List job titles.

5. What future manpower needs do you foresee in this field?

SOLID WASTE SKILL SURVEY

Name of State Connecticut

STATE AGENCY INFORMATIONS

PART I

1(a). Do you have a separate Solid Waste Management Agency? Yes X No ____
(b) If not, what agency or agencies handles Solid Waste Management problems?
County _____ Municipal _____ or private _____

2. What professions do these employees represent in your agency?

a. Engineers (X)
b. Attorneys ( )
c. Administrators (X)
d. Clerical (X)
e. Computer Specialists ( )
f. Accountants/Consultants ( )
g. Technicians ( )
h. Any other ( )

3. Has the number of employees grown or declined during the past year?
Grown

4. How many employees do you expect to need in 5 years?
About 15 more

5. Do you provide training programs for your employees? Yes X No ____

If yes, how many employees have completed these programs? All

6. How do you meet your employment needs?

a. Hire off the street? X
b. Recruit from colleges and vo-tech institutes? X
c. Employment services?
d. Labor Unions?

7. Please comment on the prospect of manpower needs in the solid waste management field.

As the more sophisticated technologies of solid waste management are developed and demonstrated on a large scale, it is expected that many new positions in the field will be opened up.

In addition, more people may be needed to administer the state program with increased demands for permitting new solid waste facilities.

STATEWIDE INFORMATIONS

PART II

A. SANITARY LANDFILLS

1. How many open dumps in your state now 41, closed during 1976 6, to be closed by 1980 25 ?

2. How many sanitary landfills in your state now 84, expected to open up in the next 5 years _____?

3. What are the average numbers of employees engaged now at each landfill 1 ?

List Job Titles

(a) Facilities (B) Management

B. INCINERATION

1. How many incinerators presently in use? 9
2. How many incinerators were closed last year? 1
3. How many are expected to close in the next 5 years? 7
4a. Is there any plan to open up new incinerators? Yes X No _____
b. If yes, state the number expecting to open up in next 5 years. Possibly in rural areas
5. Average number of employees at each incinerator? 30

List Job Titles

(A) Facilities (B) Management

Accurate job titles will come with the responses from these municipalities which have incinerators

C. COMPOSTING

1. How many composting plants are in your state? 0
Municipal Refuse Composting 0 Sewage Sludge Composting 0

2. How many are expected within 2 years _____, 5 Years _____?

3. Average number of employees at each plant? _____

List Job Titles

4. Do you think there is a future in composting? Yes _____ No X

D. RESOURCE RECOVERY

1. How many Resource Recovery Plants does your state have at present? 0

2. How many do you expect within 5 years? 3

3. Average number of employees at each plant? 75-80

List Job Titles
Accurate list of job titles is not available at this time.

4. How many Source Separation ~~Centers~~ *programs do you have? 96
Private 56 Municipal 40 State Owned 0

5. Average number of employees at Source Separation Centers? not known

E. HAZARDOUS WASTE

1. Does your state have any hazardous waste sites? Yes _____ No X
If yes, how many? _____

2. How many private companies collect and dispose of hazardous waste? 50

3. Who regulates the collection of hazardous waste?
Municipality _____ County _____ State X

4. How many people are employed in the collection and disposal of hazardous waste? ?

List job titles

possible state job titles
Field inspector I
Field inspector II
Chief field inspector
Maintainer I, II, and III

5. What future manpower needs do you foresee in this field?

There does not exist now in New England a hazardous waste treatment, processing and disposal facility. We hope such a facility will be in operation within the next 5 years. A facility of this type would employ 50-100 technical people.

* 50 firms have been issued permits to collect and haul liquid and chemical wastes. These wastes are not all hazardous.